BOSTON PUBLIC LIBRARY
3 9999 06548 363 6

EASTERN MASSACHUSETTS REGIONAL PLANNING PROJECT

Economic Base & Population Study

Volume I

Historical Analysis

GOVDOC
HC107
.M4A584
vol. 1
c. 2

PREPARED BY

METROPOLITAN AREA PLANNING COUNCIL

Publication of this Document Approved by Alfred C. Holland, State Purchasing Agent.

800-3-67-944711

Estimated Cost Per Copy: $1.31

Digitized by the Internet Archive
in 2013

http://archive.org/details/economicbasepopu01mass

ECONOMIC BASE AND POPULATION STUDY
for
EASTERN MASSACHUSETTS

VOLUME 1

Historical Analysis

Commonwealth of Massachusetts
METROPOLITAN AREA PLANNING COUNCIL

in cooperation with

Massachusetts Department of Commerce & Development
Massachusetts Bay Transportation Authority
Massachusetts Department of Public Works

and with the

Urban Renewal Administration
U.S. Department of Housing and Urban Development
Bureau of Public Roads
U.S. Department of Commerce
through the
Eastern Massachusetts Regional Planning Project

The preparation of this report was financially aided through a Federal grant from the Urban Renewal Administration of the Department of Housing and Urban Development under the Urban Planning Assistance Program authorized by Section 701 of the Housing Act of 1954, as amended.

TABLE OF CONTENTS

GENERAL SUMMARY 1

PREFACE 5

CHAPTER I, Historical Development 7
    Age of Commerce 7
    Age of Industry 8
    Growth of Diversified Economy 10

CHAPTER II, Regional Performance 12
    Population 12
    Employment 13
    Output 18
    Hourly Earnings of Production Workers 23

CHAPTER III, Personal Income and Consumer Expenditures 27
    Personal Income 27
    Consumer Expenditures 28

CHAPTER IV, Employment Trends 33
    Manufacturing Employment 35
    Non-Manufacturing Employment 38
    Distribution Within SMSAs 40

CHAPTER V, National Market Industries 44
    Key Industries 44
    Manufacturing National Market Industries 49
    Non-Manufacturing National Market Industries 54
    Local Market Industries 56

CHAPTER VI, Manpower 57
    Occupational Shifts 57
    Manpower Utilization 60
    Educational Attainment 64

STATEMENT OF METHOD 68

SALIENT FEATURES OF THE REGIONAL ECONOMY

GENERAL

* The Regional economy has shared in the growth of the past two decades, surpassing the national experience in some areas such as income and non-manufacturing employment and lagging behind the national experience in other areas such as average output and manufacturing employment.

* The structure of the Region's economy has shifted and is now such that it can more readily share in national growth.

* Despite its economic renaissance, the region has a significant proportion of underemployment and unemployment, and low education, especially among older men, which require immediate solutions.

INCOME

* Individual income in the Boston Region is both higher and rising faster than nationally.

* Manufacturing workers in Metropolitan Boston earn a higher hourly wage than those in other regions of Massachusetts, but is equal to or less than hourly wages in metropolitan areas outside the State.

EMPLOYMENT

* The Regional unemployment rate has been continually lower than the national rate for the past two decades.

* Employment in the Region rose by 147,000 jobs during the post-war period, due primarily to an expansion of non-manufacturing industries.

* Almost every new job created in the past decade required professional, technical or clerical skills.

* These changing manpower demands will mean a continuation of the trend of increasing white collar workers and declining blue collar workers in the Region.

OUTPUT

* Regional industries producing for the national market account for one-third of the Region's output and employment and stimulate $2 of output in local market industries for $1 produced for sale in national markets industries.

* In the past decade, growth in output per worker exceeded that of the nation.

THE STATE OF THE REGION: A GENERAL SUMMARY

The economy of the Boston Region is on a sounder footing than it has been in many years. At its base is a collection of strong financial and insurance institutions and one of the nation's larger concentrations of science-oriented industries. This base promises expansion outside the sphere of Federal military and research expenditures, upon which the Region has and does rely heavily.

The Region's competitive position in science and finance is likely to remain firm, unaffected by an inconvenient geographic location and a lack of natural resources. Nor is the fact that the Region is losing unskilled workers likely to be a liability, since a shift in manpower demands is occurring. Many of the older industries, for example, have resorted to automation and to jobs with higher skill requirements. While the increase in the number of white collar workers and the decline in the number of blue collar workers are due to changes within industries, they are due also to the growing number of new industries which require a higher proportion of technical and professional workers; industries such as private education, medical services, and scientific instruments. These changes seem to promise that the Region will be able to attract and serve industries of the future, providing of course that it can also attract sufficient numbers of skilled workers from other regions or develop additional professional and technical skills within the Region.

A part of the demand for skilled workers emanates from the Region's "export industries," or those which sell most of their products outside the Region but which (directly and through their employes) generate demand for local goods and services.

Every dollar of export sales generates nearly two dollars of local business. This phenomenon, known as the Multiplier Effect, is quite important to the Region economically, and emphasizes the need for programs to attract new industry to the Region and to foster the growth of existing industry.

WHAT ABOUT THE WORKER?

For the worker the outlook is both bright and bleak. The highly skilled, highly trained worker will continue to be in demand. In the last decade, almost every new job created in the Region required either professional, technical or clerical skills. For the unskilled worker, particularly the older worker, the changing demands of the Region's job market portend underemployment if not unemployment. Yet as late as 1960 one out of every three men under sixty-five had no more than an eighth grade education. One out of two had no more than a high school education.

To meet the changing demand for increased skills and to avoid employment problems, the Region will need programs to upgrade the quality and quantity of educational opportunities, including programs of vocational and technical education, and retraining programs to increase employment opportunities for the unskilled and older workers.

The manufacturing production worker in metropolitan Boston can expect to earn a higher hourly wage than workers in competing regions within the state. However, he may be less well paid than his co-workers in comparable metropolitan areas outside Massachusetts. Yet individual incomes in the Region are both higher and rising faster than they are nationally. At the same time, the average worker's output is rising faster but remaining lower than his counterpart's throughout the rest of the nation.

ALL THAT GLITTERS IS NOT

Although it has its strengths, the Region also has problems which cannot be overlooked. While employment is generally high in the Region, some sections such as Lowell, Lawrence-Haverill, and Brockton suffer high unemployment, a fact due partially to the heavy dependence of these subregions on manufacturing industries such as textiles, leather goods, and other traditional soft goods. And there is every indication that the textile and apparel industries may again decline.

Many of the export industries upon which the Region relies heavily are not growing as fast as they once did. At the same time, manufacturing employment is down in the Region while it is rising nationally.

If the Region is to realize its economic growth potential, the danger signals must be recognized in time and dealt with effectively. When they are, both the Region and its population will reap not just the residue of national progress but the rewards of local leadership and initiative which have historically been present.

PREFACE

Metropolitan areas or regions are more than just places of residence for two-thirds of this nation's people; they are the workshops of American civilization. They are vast aggregations of industrial might, scientific skills and human resources. The characteristics of modern urbanism are largely a result of the changes brought about by industrialization. These changes, such as mass production of goods and increasing specialization, are familiar to all Americans. What is not always recognized is that economic forces are prime determinants of the condition of the natural environment and of the physical structure of cities and regions.

How a metropolitan community provides for the living of its residents, and how it supplies them with goods and services, depends on the economic structure of the area, the pattern of production which supports the region. The structure may be highly diversified, as it is when there are many types of industry or business in the region; or it may be relatively simple as it is when a single industry or group of industries, such as the tourist business, dominates the area's economic life. The nature of this economic base is important since the development potential of a region is closely linked to the prospects and fortunes of its key industries.

The purpose of this Economic Base & Population Study is to analyze past trends in the Region's development, to anticipate the direction of future development, and to identify specific means and programs for assisting this development.

The study "Region" is composed of 152 cities and towns in the eastern portion of Massachusetts. Most of the communities fall roughly within a thirty-five mile radius of the State House in Boston.

Volume I of the Economic Base & Population Study contains an historical inventory and analysis of regional economic development during the post-war period, 1947 to 1963. Subsequent volumes present a series of output and employment projections for the Region by five year intervals to the year 2000, and specific recommendations for the strengthening and directing of these economic trends.

I

HISTORICAL DEVELOPMENT (1)

Analysis of the Region's economy since early in the 18th Century suggests three rather distinct phases of economic development. For over a century, Boston was primarily a commercial center. But by 1865 Boston had been established as a manufacturing center, largely in the soft-goods industries. Finally, early in the 20th Century, the Region began to shift toward the diversified economy which characterizes it today.

During this process of development, the Region has had to compensate for its isolation from the Midwest and Canada, for a scarcity of natural resources, and for a continuing loss of many of its workers.

THE AGE OF COMMERCE

With the port of Boston as the fulcrum of the Region's economy, Boston for over a century competed with New York and Philadelphia as one of the nation's leading commercial centers. Prior to the Revolutionary War, the area was involved in active trade between England and the West Indies.

---

(1) This section on historical developments prior to 1947 is condensed from a more detailed discussion in Mass. Transportation Commission, The Boston Region, 1963.

Victory in the American Revolutionary War and the subsequent conflict between the French and British empires in the New World at first proved disastrous to Boston's economy. Trade with Europe was sharply reduced as a result of Boston's exclusion from the British trading system and Britain's blockades of the Region's ports. Boston merchants, however, began new and lucrative commercial activities. These included privateering, trade with Russia and the Far East, and Columbia River fur trade. The more important long-range effect of the disruption of commerce with Europe was the establishment of infant manufacturing industries in the Region.

THE AGE OF INDUSTRY

During the second quarter of the Nineteenth Century, New York gradually pulled ahead of Boston in commercial activities and by the close of the Civil War had firmly established itself as the leader. The opening of the Erie Canal and other waterways, and later the railroads, enabled New York to tap the rich, growing Midwestern markets far more effectively than Boston could.

The Region's previous success in commercial activities, however, provided investment capital on which to base further economic growth. Boston capitalists financed manufacturing within the New England area and later were key investors in railroad development throughout the nation. These investments returned profits which further enlarged the Region's pool of investment capital.

Manufacturing industries were established on the fringes of the Boston Region -- in Lynn and Salem (shoes and leather), in Lowell (cotton textiles), in Lawrence (wool textiles), and in Fall River and Bedford (textiles).

Prior to 1845, the Boston area had contained relatively few industries other than handicrafts. Population growth was slow and out-migration was high. After the middle of the century, however, a large influx of immigrants from famine-stricken Ireland changed the situation radically. Manufacturing industries boomed as a result of the vast pool of low-cost labor provided by the immigrants. Low labor costs compensated for the Region's locational handicap and stimulated higher production in ready-made apparel, sugar and oil refining, primary and fabricated metals, musical instruments, ship-building, glass, and shoes and other leather goods.

Between 1845 and 1865 Boston became the nation's fourth-ranking manufacturing city. The number of industrial employes in the city doubled during the first decade of this spectacular period of growth and doubled again between 1855 and 1865.

During the rest of the Nineteenth Century, the pattern of expansion continued but the source of labor changed. French Canadians immigrated not only to the Merrimack Valley but also to the textile milling areas in the northern part of the Region; Italians entered building trades and the shoe industry; and Jews from eastern Europe entered the apparel-manufacturing industry and retail trades.

GROWTH OF A DIVERSIFIED ECONOMY

In the early 1900's Boston shifted into another phase of development as the soft goods industries, particularly leather goods and textiles, began to decelerate. By the mid-1920's much of the textile industry had moved out of the Region, although the Region remained heavily dependent upon this industry until the end of World War II. Even through the early 1940's the Region's economy retained the characteristics of the early stages of manufacturing development.

During the Second World War the Region's industrial base began to change as technological research at universities in the Region stimulated electronics and instrument manufacturing. Growth in these industries accelerated throughout the early years of the Cold War and the Korean Conflict.

While the Region's economy during the past century was largely based on low-wage industries, its current economy is widely diversified, underwritten by considerable financial strength, and stimulated by a preeminence in research and development industries. The economy has increasingly shifted to a reliance on intellectual capital; on the products of its major universities; and on the skills of a corps of financial, professional and technical personnel ranking among the best in the nation.

II

REGIONAL PERFORMANCE

POPULATION

Population in the Planning Area grew slowly between 1947 and 1963. By 1963 it had risen at an annual rate of .87 percent from 3,037,100 to 3,490,200. During the same period, annual growth was .92 percent for Massachusetts and 1.69 for the United States.

TABLE 1

Cumulative Annual Rate of
Population Growth

	1947-55	1955-63	1947-63
Planning Area	.86	.88	.87
United States	1.73	1.67	1.69

As a result, the Region's share of state and national population declined. Its share of Massachusetts population dropped from 66.4 to 65.9 percent, while its share of U. S. population dropped from 2.10 to 1.84 percent.

EMPLOYMENT

Employment, like population, grew at a slower rate in the Region than it did in the United States between 1947 and 1963. However, the Region's performance improved during the second half of the study period (1955 - 1963), while the United States fell below its earlier rate of growth.

TABLE 2

Cumulative Annual Rate of Growth in Wage & Salary Employment

	1947-55	1955-63	1947-63
Planning Area	.61	.92	.76
United States	1.81	1.40	1.61

All other measures of economic activity also indicate that this was a period of great resurgence in the Planning Area. This reflected two things: 1) a leveling off of the precipitous decline in the textile industry, and 2) significant rates of growth in industries such as electrical machinery, printing and publishing, instruments, miscellaneous business services, real estate, insurance, and private education.

Figure 2 illustrates the trends of employment in manufacturing and non-manufacturing industries in the Planning Area and the United States from 1947 to 1963.

Manufacturing: Manufacturing employment in the Region dropped from 428,900 in 1947 to 394,000 in 1963. This decline of 8.1 percent occurred while manufacturing employment nationally expanded by 9.4 percent.

However, national manufacturing employment reached a peak in 1953. The subsequent drop was due not only to a slow-down in the growth of national demand, which was especially pronounced between 1957 and 1962, but also to gains in automation and work efficiency. The Planning Area also experienced these advances in technology, for despite declining manufacturing employment, the real value of manufacturing output in the Region rose.

Manufacturing accounted for a larger proportion of nonagricultural employment in the Region than in the nation in 1947. However, by 1963 manufacturing was approximately the same proportion of regional as of national employment. This resulted from an absolute decline in manufacturing employment regionally while manufacturing employment nationally was expanding, though the nation's manufacturing employment was expanding at a slower rate than its non-manufacturing employment.

TABLE 3

Manufacturing Employment
as Percent of Total

	1947	1955	1963
Planning Area	37.7	34.9	30.7
United States	35.4	33.3	30.0

Non-Manufacturing: While the Region was unable to keep pace with the national rate of growth in non-manufacturing employment, its performance was substantially better in the second half of the study period than it was from 1947 to 1955.

TABLE 4

Percent Change in Non-Manufacturing Employment

	1947-55	1955-63	1947-63
Planning Area	9.7	14.5	25.6
United States	19.3	17.3	39.9

Both regionally and nationally, employment grew substantially faster in non-manufacturing than in manufacturing industries.

Figure 1
Population Growth
Planning Area, Massachusetts and the United States
1947-1963

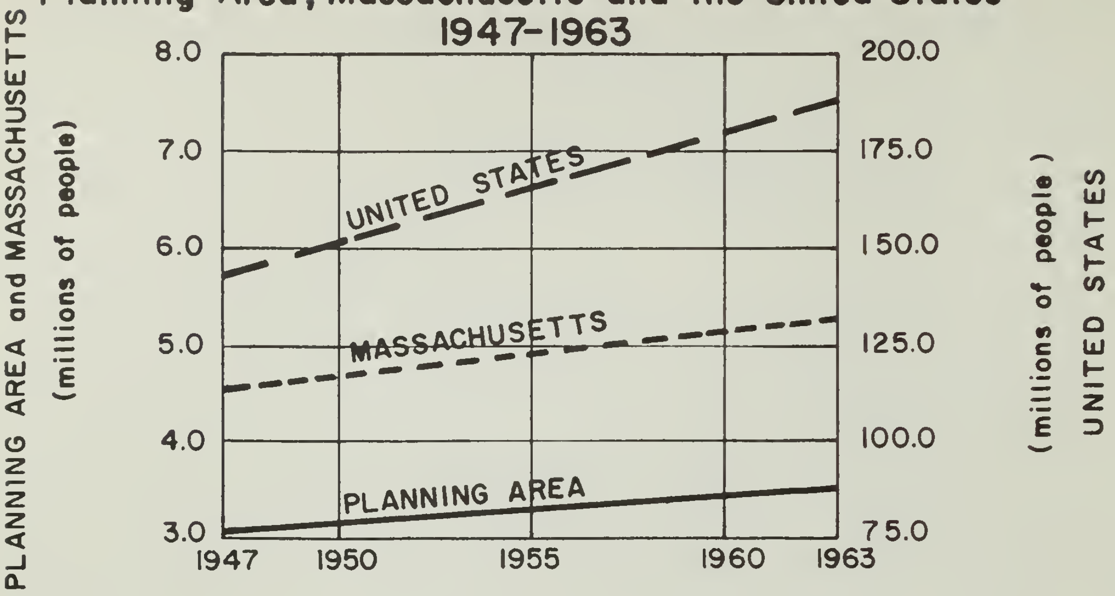


Figure 2
Employment - Manufacturing and Non-Manufacturing
Planning Area and the United States
1947-1963

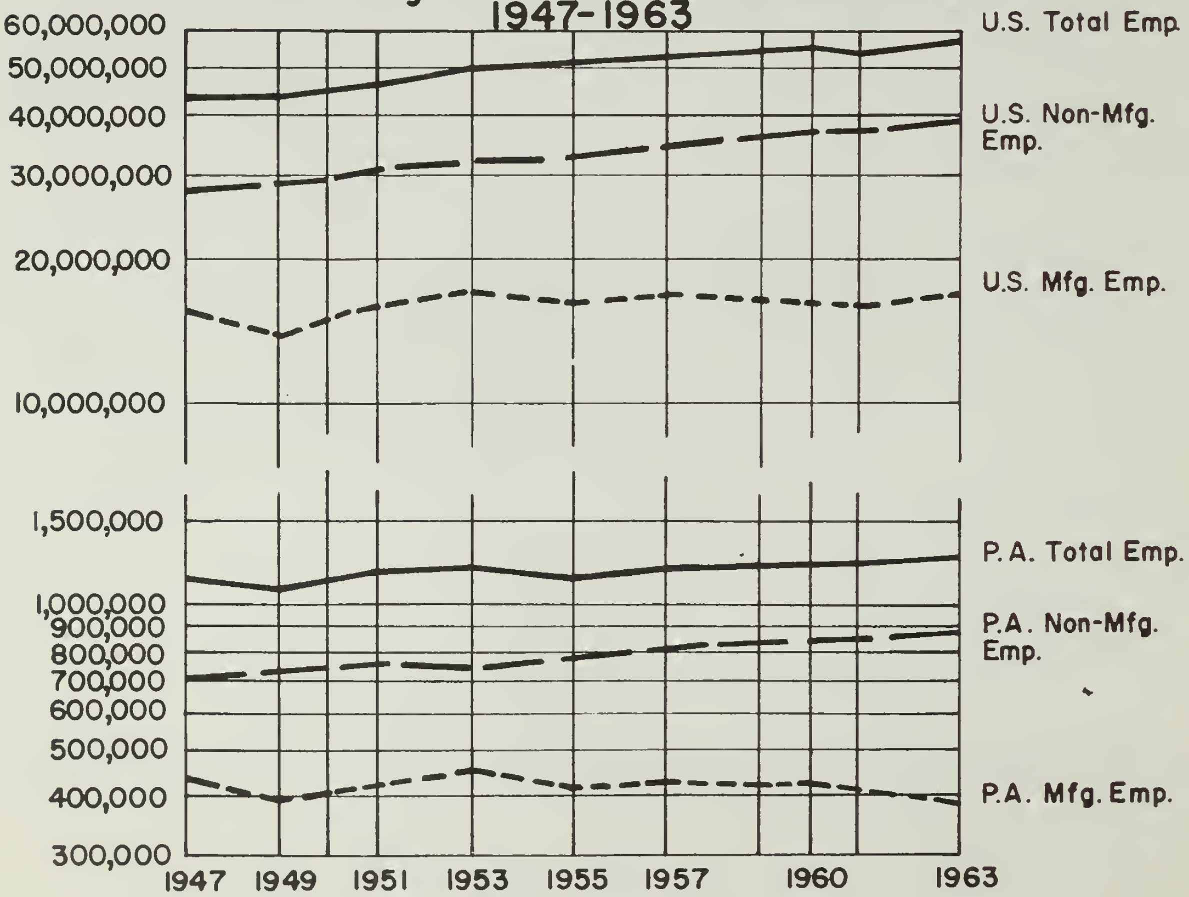


Figure 3
Gross National Product and Gross Regional Product
Planning Area and the United States
1947–1963

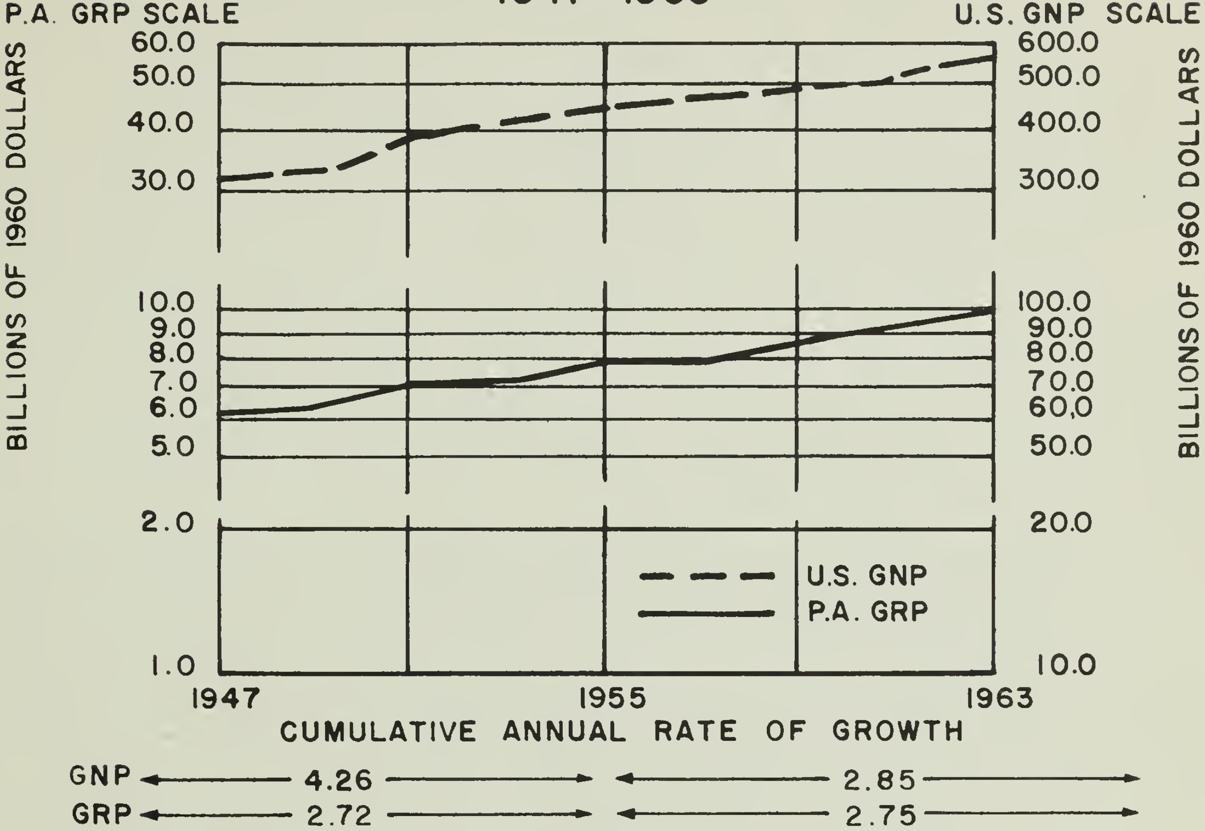
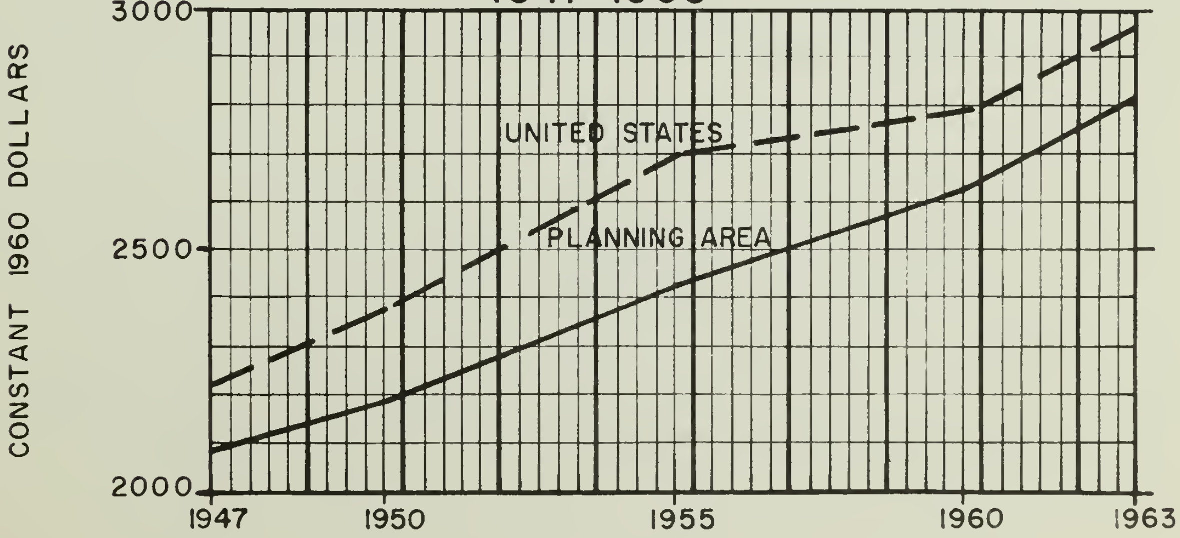


Figure 4
Output Per Capita
Planning Area and the United States
1947–1963



OUTPUT

The Region's growth in output, like population and employment, was below the national average. The real value of non-agricultural goods and services produced in the Planning Area, or the "Gross Regional Produce" (2), increased by approximately 54-percent between 1947 and 1963. This was a cumulative annual rate of 2.74 percent, compared to 3.55 percent for the United States. However, the Region's performance from 1955 to 1963 was only slightly below that for the nation (see Figure 3).

Output Per Worker: Output per worker provides a measure of the efficiency of the Region's labor force. It is a measure influenced by the price of output, the level of technology, the general "quality" of the labor force, the relative amounts of capital and labor combined in the production process of particular industries, and differences in the composition of the industrial structure. Assuming that the first four variables do not differ significantly between the Region and the nation, variations between regional and

---

(2) Gross Regional Product is the regional equivalent of Gross National Product, which is defined as the market value of final goods and services produced by the economy in any given year. In this report "GRP," "output," and "product" will be used synonymously. Gross National Product and Gross Regional Product are not strictly comparable in that GRP does not include agricultural output or the output of "self-employed" individuals.

TABLE 5

Change in Output Per Worker
by Manufacturing and Non-Manufacturing
Planning Area and the United States
1947, 1955, 1963

	(Current Dollars)					
	1947		1955		1963	
	P.A.	U.S.	P.A.	U.S.	P.A.	U.S.
All Industries	$3,926	$4,281	$5,756	$6,608	$7,752	$8,498
Manufacturing	3,998	4,304	6,121	7,319	8,573	9,757
Non-Manufacturing	3,883	4,268	5,564	6,221	7,389	7,903

	Percent Increase					
	1947 - 1955		1955 - 1963		1947 - 1963	
	P.A.	U.S.	P.A.	U.S.	P.A.	U.S.
All Industries	46.6	54.4	34.7	28.6	97.5	98.5
Manufacturing	53.1	70.1	40.1	33.3	114.4	126.7
Non-Manufacturing	43.3	45.8	32.8	27.0	90.3	85.2

national output per worker estimates may be attributed to differences in the composition of the industrial structure.

Estimates of output per worker in the Planning Area in both manufacturing and non-manufacturing were consistently lower than the national average during the post-war years. (3) The Region's growth in output per worker, however, exceeded the national average in both manufacturing and non-manufacturing during the second half of the study period. As a result of this more rapid rate of growth, the Planning Area by 1963 had somewhat improved its position in non-manufacturing output per worker compared with the nation (see Table 5).

In both the Planning Area and the United States, output per worker was consistently lower in non-manufacturing than it was in manufacturing. This difference is increasing as a result of the higher growth rate in manufacturing productivity. The gap is not increasing as fast in the Planning Area, however, as it is nationally.

In only four manufacturing groups did the Region's output per worker consistently exceed the national average between 1947 and 1963. These were: textiles, lumber, leather and transportation equipment. In only one non-manufacturing group, services, did output per worker consistently exceed the national average(4) (see Table 7).

---

(3) Estimates of output per worker in this section were obtained by dividing the current dollar value of the Gross Product of an industry group by employment in that industry group.

Between 1947 and 1955, growth in output per worker exceeded the national average in nine of the 26 industry groups. Between 1955 and 1963, however, 17 of the Region's industry groups grew faster than the national average.

TABLE 6

Ratio of Non-Manufacturing to Manufacturing Output per Worker

	1947	1955	1963
Planning Area	97.1	90.9	86.2
United States	99.2	85.0	81.0

Per Capita Output: In order to assess the impact of these changes on the actual "well-being" of the Region's residents, it is useful to look at per capita output.(5) Such a measure, unlike pure volume estimates, allows for

---

(4) It should not be inferred that the relationship between the regional and the national average in a particular industry group necessarily holds for each of the components of that group.

(5) This measure is derived by dividing total output (GNP or GRP) by total population. It is appropriate for comparing areas over time.

TABLE 7

Output Per Worker in the Planning Area As a Ratio of Output per Worker in the U. S. 1947, 1955, 1963

Industry Group	(Current Dollars) 1947	 1955	 1963
ALL INDUSTRIES	.917	.871	.912
MANUFACTURING	.929	.836	.879
Food	1.003	.975	.990
Tobacco	1.019	.944	.879
Textiles	1.078	1.113	1.181
Apparel	.984	1.024	1.090
Lumber	1.468	1.185	1.173
Furniture	1.014	.980	1.016
Paper	.953	.900	.902
Printing	.935	1.240	.999
Chemicals	1.097	.976	.949
Petroleum	.362	.396	.224
Rubber	.982	.869	.904
Leather	1.053	1.067	1.080
Stone, Clay, Glass	.984	1.019	1.068
Primary Metals	1.037	.894	.843
Fabricated Metals	.996	.893	.920
Non-Elec. Machinery	.980	.914	.984
Elec. Machinery	.965	.924	.960
Trans. Equip.	1.020	1.015	1.006
Instruments	1.045	.896	.943
Misc. Mfg.	1.690	.865	1.152
NON-MANUFACTURING	.910	.894	.935
Mining & Construction	.838	.809	.835
Trans., Comm. & Utilities	1.101	1.084	.995
Wholesale & Retail Trade	.963	.954	1.079
Finance, Insur. & R. E.	.755	.774	.794
Services	1.043	1.082	1.086
Government	.774	.819	.801

population changes. For example, if the value of output increases by three-percent and population increases by four-percent, the real value of goods and services available to each individual declines. Both the United States and the Region showed steady increases in per capita output over the study period. However, Planning Area per capita output was below the U. S. average in each of the observation years (6) (see Figure 4).

During the first half of the period, the Planning Area grew more slowly than the nation. The second half was a period of recovery for the Region. Per capita output grew 15.8 percent compared with 9.7 percent for the nation.

HOURLY EARNINGS OF PRODUCTION WORKERS

Labor costs in the Planning Area are generally lower than those of competing areas, as illustrated by hourly wage rates in selected industries in various labor markets throughout the United States. (7) Boston's average hourly wage exceeded the U. S. average in seven of the 11 industries listed in Table 8 (no hourly data were available for the remaining industries in the Boston area). However, when compared with competing metropolitan areas outside Massachusetts, Boston wages were lower in 34 out of 55 observations. (8)

---

(6) If agricultural output and the output of "self-employed" individuals had been included in GRP as in GNP the difference would have been less.

(7) For each industry group, hourly wages are included for the top five labor market areas as determined by the percent of total U. S. employment accounted for by that area.

In the four industry groups -- textiles, apparel, chemicals, and leather -- in which wages were higher in the Boston Region than in any other region, employment declined. In two of these, textiles and leather, the decline was precipitous. (9) In contrast, employment rose in six of the seven industries in which Boston wages were consistently lower than those in competing regions. The exception was food and kindred products which is a predominately local or regional industry, not likely to be as sensitive to wage levels in other parts of the country.

When compared to labor markets within Massachusetts, however, the Region appears to be at a locational disadvantage with respect to hourly wage rates of production workers. Wage rates in the Planning Area exceeded those in three other Massachusetts labor markets in most cases (see Table 8). Where wage rates are an important locational factor, as they are in apparel manufacturing, this is likely to provide some incentive for industry relocation to the lower-wage areas. This relocation can take the form of actual plant relocation, of opening branch plants, or of creation of new firms in the low-wage areas. There is some indication that this has already begun to happen.

---

(8) A report, Locational Information on the Greater Boston Area, issued by the Greater Boston Chamber of Commerce presented a comparison of wage rates by occupation using U. S. Department of Labor surveys for 1961. Boston's hourly wages in 43 selected occupations were compared with those in ten other major cities. Hourly earnings in Boston were higher in only 30-percent of all observations. Boston's hourly earnings were equal to or greater than at least five other cities in only six occupations: bricklayer, electrician, painter, plumber, watchman, and shipping packer.

(9) See Appendix, Table C-3.

TABLE 8

Wage Rates for Production Workers
in Selected Manufacturing Industries
Boston and Other Metropolitan Areas, 1963

Labor Market Areas	Food	Textile	Apparel	Paper	Print'g	Chemicals	Leather	Fab. Metals	Mach.	Elect. Mach.	Instruments
U.S. Average	$2.31	$1.71	1.73	$2.48	$2.89	$2.72	$1.76	$2.61	$2.78	$2.46	$2.49
BOSTON, MASS.	2.35	2.00	2.06	2.32	3.13	2.76	2.16	2.51	2.88	2.42	2.40
Fall River, Mass.	--	1.75	1.66	--	--	--	--	--	--	--	--
New Bedford, Mass.	--	1.79	1.57	--	--	--	--	2.49	--	1.53	--
Springfield-Chicopee, Mass.	2.44	1.88	1.65	2.31	2.25	--	--	2.49	2.71	1.83	--
Los Angeles Long Beach, Cal.	2.94	--	1.87	2.72	3.61	--	--	2.80	2.93	2.92	2.77
San Francisco-Oakland, Cal.	2.94	--	--	--	3.85	--	--	--	--	--	--
Wilmington, Del.	--	--	--	--	--	3.36	--	--	--	--	--
Chicago, Ill.	2.68	--	1.83	2.42	3.27	2.72	2.31	2.79	2.88	2.48	2.57
Minn-St. Paul, Minn.	--	--	--	2.67	--	--	--	--	--	--	--
St. Louis, Mo.	--	--	--	--	--	--	1.82	--	--	--	--
Manchester, N.H.	--	--	--	--	--	--	1.85	--	--	--	--
Neward, N.J.	--	--	--	--	--	2.76	--	--	--	2.55	--
Peterson-Clifton-Passaic, N.J.	--	--	--	--	--	--	--	--	--	--	3.45
New York City	2.76	2.23	2.26	2.31	3.48	2.67	1.90	2.59	--	2.29	2.44
Rochester, N.Y.	--	--	--	--	--	--	--	--	--	--	3.00
Greensboro-High Point, N.C.	--	1.61	--	--	--	--	--	--	--	--	--
Cleveland, Ohio	--	--	--	--	--	--	--	2.89	2.99	--	--
Allentown-Bethlehem-Easton, Pa.	--	--	1.72	--	--	--	--	--	--	--	--
Philadelphia, Pa.	2.42	1.91	1.93	2.46	3.10	2.72	--	2.76	2.76	2.61	--
Providence-Pawtucket, R. I.	--	1.85	--	--	--	--	--	--	--	--	--
Greensville, S.C.	--	1.69	--	--	--	--	--	--	--	--	--
Milwaukee, Wis.	--	--	--	--	--	--	2.11	--	3.00	--	--

Source: U. S. Department of Labor, Employment and Earnings Statistics for States and Areas 1939-1963, Bulletin No. 1370-1, U. S. Government Printing Office, Washington, 1964.

III

PERSONAL INCOME AND CONSUMER EXPENDITURES

PERSONAL INCOME

Total personal income [10] in the Planning Area reached a level of $9.2 billion in 1963, an increase of $3.3 billion over the 1947 level. This represents a growth rate of 2.83 percent per year, with the greatest growth occurring after 1955 (see Figure 5).

The largest source of personal income in both the Planning Area and the United States was wages and salaries. This source was somewhat more important in the Planning Area, where wages and salaries accounted for between 68 and 70-percent of personal income, compared with 64 to 68-percent in the United States (see Table 9).

---

(10) Personal income is defined as current income before taxes received by individuals, unincorporated businesses and non-profit institutions. It has five major sources: wages and salaries, other labor income, proprietors' income, property income, and transfer payments minus personal contributions for social insurance. In addition, allowances are made for certain non-monetary benefits such as rental value of home ownership and services furnished without payment by financial intermediaries. In this study personal income is expressed in constant 1960 dollars.

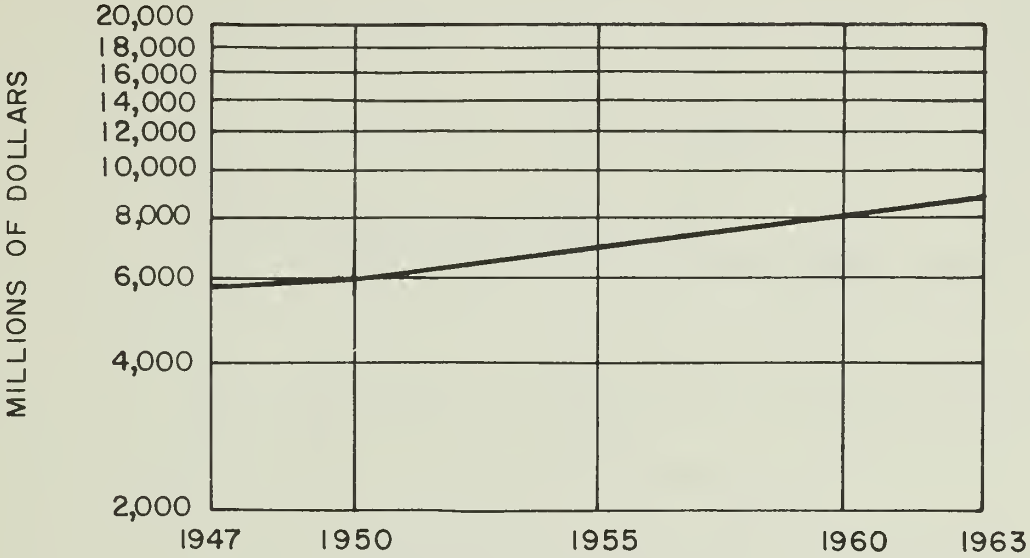
Proprietors' income was only half as significant in the Planning Area as in the nation in 1947. Although this gap has been slowly decreasing, proprietors' income still accounted for only 6.2 percent of the Region's total income in 1963 in contrast to 10.9 percent for the nation.

Per Capita Income: Per capita real personal income has been higher in the Planning Area than in the United States since 1947. From 1947 to 1955 the rate of growth was not as high for the Planning Area as for the United States. This slower growth reduced the percentage by which per capita income in the Region exceeded that in the nation from 10.8 percent in 1947 to 6.1 percent in 1955. After 1955 this trend reversed. By 1963 per capita personal income in the Planning Area was an estimated $2,625 compared with an estimated national average of $2,365.

CONSUMER EXPENDITURES

"Consumer expenditures" is the market value of goods and services purchased by individuals. The difference between personal income and consumer expenditures is personal tax payments and personal savings. The proportion of income spent on consumer goods and services was lower in the Planning Area than in the United States during post-war years. As incomes have risen, however, the proportion of income expended has declined both regionally and nationally. As a result, the ratios by 1963 were nearly equal.

Figure 5
Growth of Total Personal Income
Planning Area
1947-1963



CUMULATIVE ANNUAL RATE OF GROWTH

1947-1955	1955-1963
2.45	3.20

Table 9
Source of Personal Income in the Planning Area and U. S.
1947 — 1963

	(percent distribution)			
	1947		1963	
Source	P.A.	U.S.	P.A.	U.S.
TOTAL	100.0	100.0	100.0	100.0
Wage Salaries	68.8	64.1	69.3	67.2
Other Labor Income	1.3	1.2	2.8	2.8
Proprietor's Income	8.7	18.5	6.2	10.9
Property Income	14.6	11.1	14.0	13.6
Transfer Payments	7.6	6.2	10.2	7.9
LESS:				
Personal Contributions for Social Security	1.0	1.1	2.5	2.5

NOTE: Detail may not add to totals due to rounding.

Figure 6
Per Capita Income
Planning Area and the United States
1947-1963

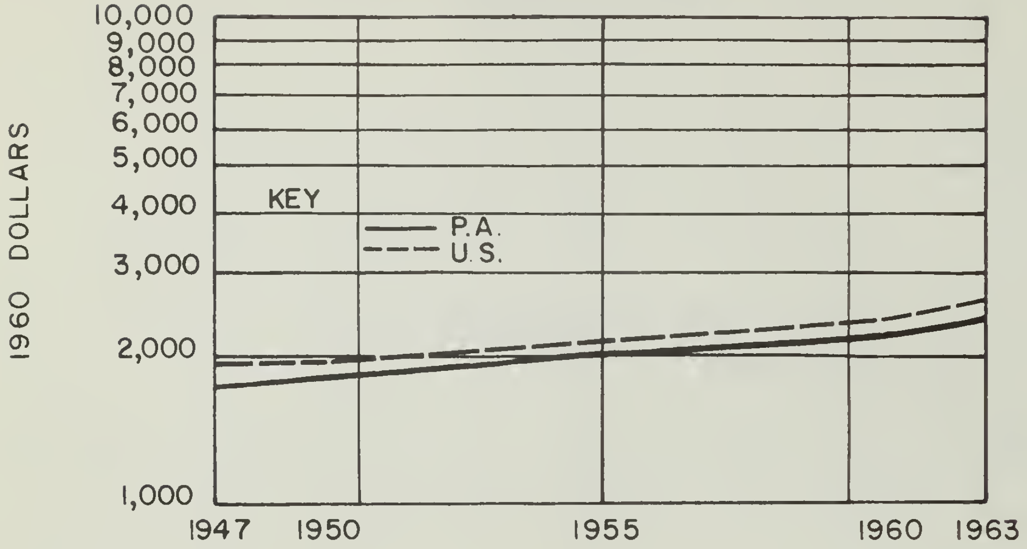


Figure 7
Distribution of Consumer Expenditures among Major Categories
Planning Area
1963

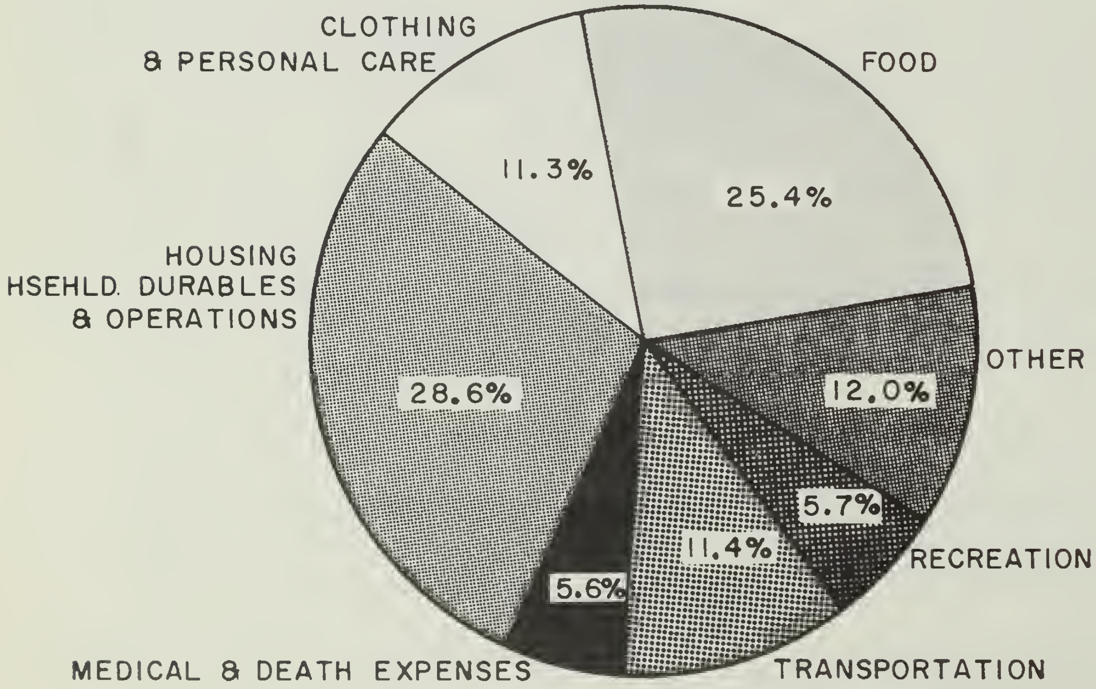


TABLE 10

Total Consumer Expenditures as a
Percent of Total Personal Income

	1947	1950	1955	1960	1963
Planning Area	84.8	84.2	82.0	80.5	80.3
United States	86.3	85.4	82.8	81.8	80.8

Another effect of the rise in incomes has been the decline, regionally and nationally, of food as a share of total consumer expenditures. Regionally, food expenditures fell from 36.9 to 25.4 percent over the 16-year period. The regional and national percentages differed throughout most of the period, but were identical in 1960 and 1963 (see Table 11).

Clothing and personal care as a share of expenditures also declined regionally and nationally. The share regionally remained slightly lower than the national average.

In contrast, housing, including household durable goods and household operation, increased both regionally and nationally, with the Planning Area rising faster.

Both transportation expenses and medical and death expenses increased, while both remained lower than the national average. However, transportation outlays, especially for automobile purchase and operation, increased more rapidly in the Region than they did in the nation.

The share of expenditures for recreation showed no consistent pattern over the study period.

The "other" category includes education, religious and welfare, personal business, and foreign travel expenditures. This category's share rose steadily throughout the 16 year period, but rose faster in the Planning Area than it did nationally.

There is no single explanation for the differences in these consumer spending patterns. They are affected by differences in prices, age composition, tastes and the level and distribution of income.

IV

EMPLOYMENT TRENDS

Employment in the Region rose by 147,000 (12.9 percent) between 1947 and 1963. This was due to an expansion in non-manufacturing employment sufficient to off-set a loss of nearly 35,000 employes in manufacturing. As a result, by 1963 non-manufacturing employment had risen from 62 to 69-percent of total employment.

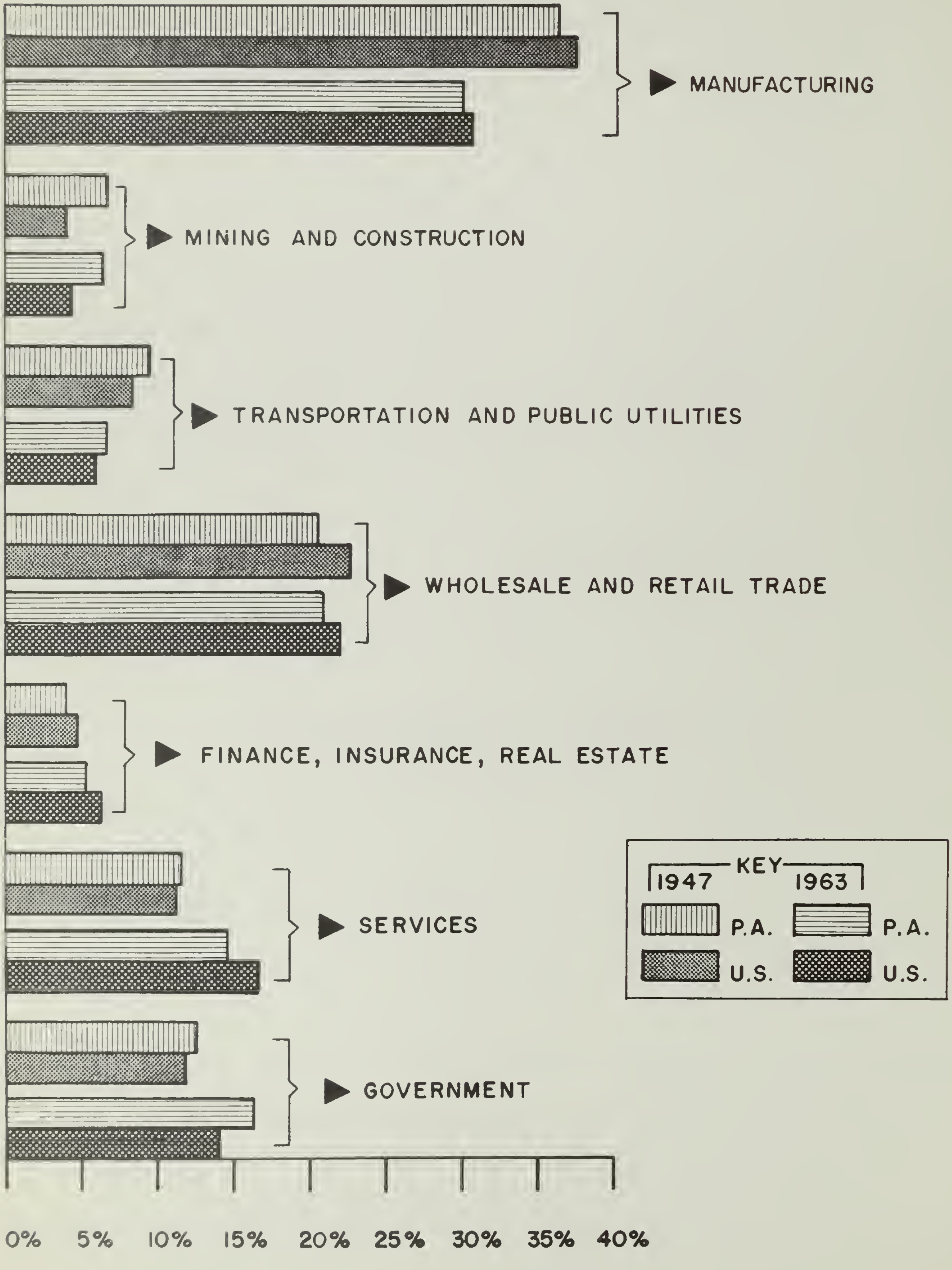
TABLE 12

Employment Change
by Manufacturing and Non-Manufacturing
1947, 1955, 1963

	Thousands of Workers			Percent Change		
	1947	1955	1963	1947-1955	1955-1963	1947-1963
Total Empllyment	1137.5	1194.2	1284.6	4.98	7.57	12.93
Manufacturing	428.9	416.7	394.0	-2.84	-5.45	-8.14
Non-Manufacturing	708.6	777.5	890.6	9.72	14.55	25.68

In most respects the regional composition of employment was similar to that for the nation. Notable deviations occurred in trade, finance, and services, which in 1963 accounted for

Figure 8
Percent Distribution of Employment by Major Industry Category Planning Area and the United States
1947-1963



a larger share of total non-agriculture employment in the Region than in the nation (see Figure 8).

MANUFACTURING EMPLOYMENT

Manufacturing employment in the Planning Area decreased by 34,900 between 1947 and 1963. This decline was the result of a loss of 87,600 employes in eleven industry groups, and an increase of 52,600 employes in nine other groups.

Eighty-four percent of the gross decline in manufacturing employment occurred in textiles, leather and food. Seventy-nine percent of the gross increase in manufacturing employment occurred in the electrical machinery, transportation equipment, and miscellaneous manufacturing industries (see Table 14 and Figure 9).

In 1947 the five industries with the highest employment--leather, textiles, electrical machinery, food, and non-electrical machinery -- accounted for 55-percent of total employment. By 1963 employment in the top five industries had dropped to 49-percent of total employment. Printing and publishing had replaced textiles, which dropped from second to thirteenth position in the sharpest decline experienced by any industry. While textiles accounted for 14-percent of all manufacturing employment in 1947, it accounted for only five-percent in 1963.

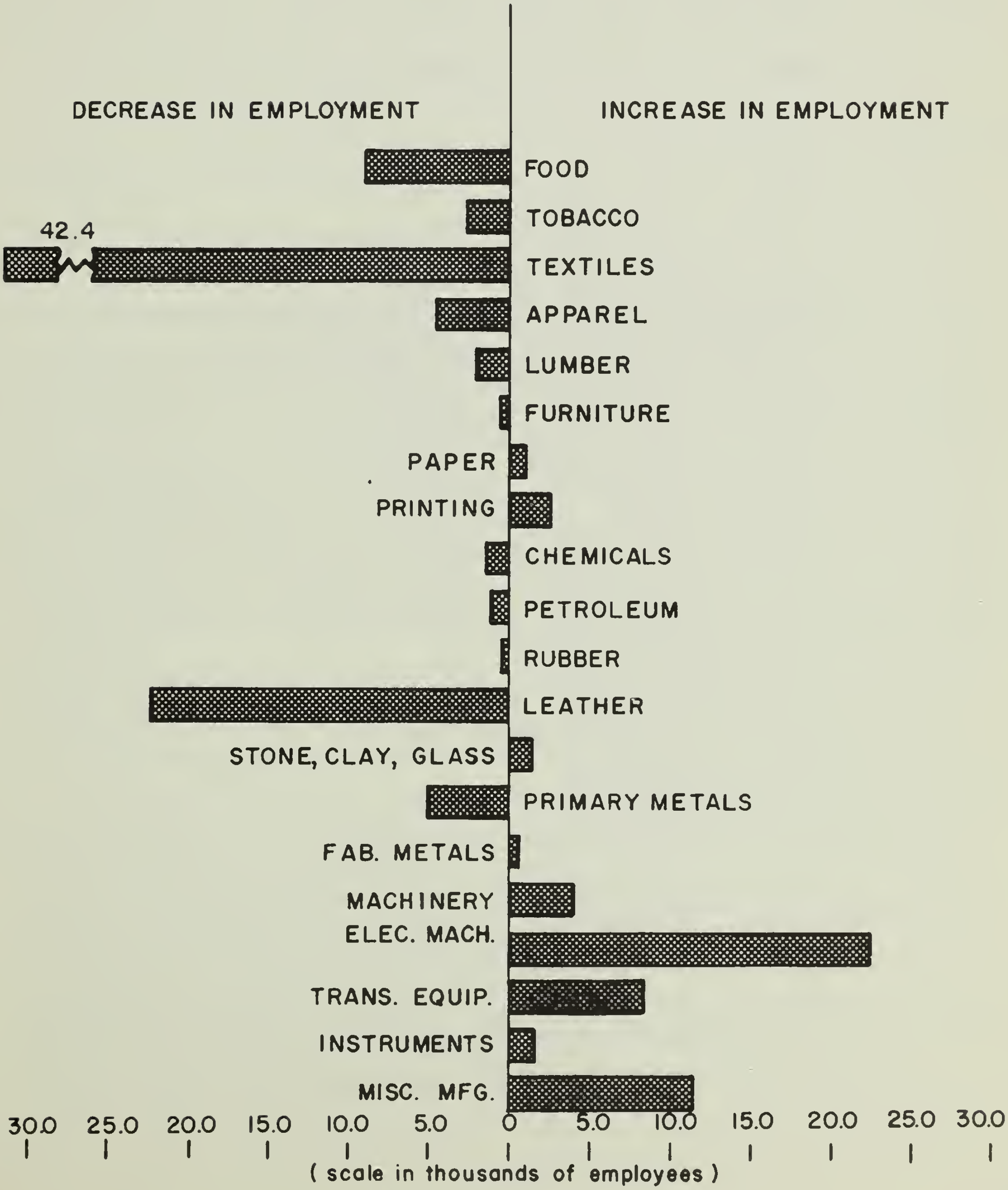
TABLE 13

Change in Manufacturing Employment by Industry Group 1947, 1955, 1963

	Employment in thousands			Absolute Change	Percent Change
Industry	1947	1955	1963	1947-63	1947-63
TOTAL MANUFACTURING	428.9	416.7	394.0	-34.9	- 8.1
NONDURABLE					
Food	40.5	37.4	31.5	- 9.0	-22.2
Tobacco	.3	.3	.1	- .2	-66.7
Textiles	60.8	28.0	18.4	-42.4	-69.7
Apparel	32.2	34.0	27.8	- 4.4	-13.7
Paper	15.4	16.7	16.5	+ 1.1	+ 7.1
Printing	25.2	26.1	27.6	+ 2.4	+ 9.5
Chemicals	11.9	11.9	10.6	- 1.3	-10.9
Petroleum	1.5	1.5	.9	- .6	-40.0
Rubber	21.7	21.5	21.5	- .2	- .9
Leather	61.3	54.8	39.2	-22.1	-36.1
DURABLE					
Lumber	4.9	3.2	2.9	- 2.0	-40.8
Furniture	5.8	6.1	5.3	- .5	- 8.6
Stone, Clay & Glass	4.1	5.3	5.3	+ 1.2	+29.3
Primary Metals	11.8	7.8	6.9	- 4.9	-41.5
Fabricated Metals	19.6	20.3	20.0	+ .4	+ 2.0
Non-Elec. Machinery	35.4	35.0	39.5	+ 4.1	+11.6
Electrical Machinery	41.5	58.1	63.7	+22.2	+53.5
Trans. Equipment	8.7	18.6	16.9	+ 8.2	+94.3
Instruments	17.4	13.8	19.1	+ 1.7	+ 9.8
Misc. Manufacturing	9.0	16.2	20.3	+11.3	+125.6

NOTE: Detail may not add to totals due to rounding.

Figure 9
Change in Manufacturing Employment by Industry Group
Planning Area
1947 - 1963



Durable-Nondurable Goods: The concentration of manufacturing employment shifted from nondurable goods industries in 1947 to durable goods industries by 1963. Nondurables accounted for over 63-percent of manufacturing employment in the Region in 1947; by 1963 this figure had fallen to 49-percent. Of the eleven industry groups in which employment declined between 1947 and 1963, eight were nondurables. This shift brought the Region into closer alignment with the national pattern.

TABLE 14

Durable and Nondurable Goods
As Percent of Total Manufacturing Employment
Planning Area and the United States
1947, 1955, 1963

	1947		1955		1963	
	P. A.	U. S.	P. A.	U. S.	P. A.	U. S.
Durables	36.9	53.9	44.2	56.5	50.7	56.7
Nondurables	63.1	46.1	55.8	43.5	49.3	43.3
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0

NON-MANUFACTURING EMPLOYMENT

Employment in non-manufacturing industries in the Planning Area increased by 182,000 between 1947 and 1963. This represents an increase of 213,300 employes in seventeen of twenty-seven non-manufacturing industries and small declines totaling 31,500 in the other ten industries (see Table 15). Six indus-

TABLE 15

Non-Manufacturing Employment by Industry Group 1947-1963

	Employment in thousands			Absolute Change	Percent Change
Industry	1947	1955	1963	1947-63	1947-63
TOTAL NON-MANUFACTURING	708.6	777.5	890.6	+182.0	+ 25.7
Mining	.7	.9	.6	- .1	- 14.3
Construction	45.3	55.2	57.3	+ 12.0	+ 26.5
Railroad Trans.	14.8	12.2	6.6	- 8.2	- 55.4
Trans. except R.R.	37.0	33.9	37.3	+ .3	+ .8
Communication	29.9	26.3	20.9	- 9.0	- 30.1
Utilities	12.1	12.9	11.7	- .4	- 3.3
Wholesale Trade	63.2	66.5	74.1	+ 10.9	+ 17.2
Retail Trade	192.0	196.7	209.1	+ 17.1	+ 8.9
Finance & Real Estate	33.2	38.9	50.9	+ 17.7	+ 53.3
Insurance	20.4	23.9	30.4	+ 10.0	+ 49.0
Hotels	9.9	8.3	8.4	- 1.5	- 15.2
Personal Services	24.8	21.0	21.1	- 3.7	- 14.9
Business Services	8.6	12.3	37.3	+ 28.7	+333.7
Repair Services	2.7	2.5	3.0	+ .3	+ 11.1
Motion Pictures	6.6	4.5	3.5	- 3.1	- 47.0
Other Amusements	8.5	6.6	6.7	- 1.8	- 21.2
Medical Services	20.4	31.7	46.9	+ 26.5	+129.9
Legal Services	3.1	3.7	4.6	+ 1.5	+ 48.4
Private Higher Education	16.2	22.8	33.8	+ 17.6	+108.6
Voc. Schools & Employment Agencies	1.9	1.3	1.2	- .7	- 36.8
Private Elem. & Second. Education	6.2	8.8	9.3	+ 3.1	+ 50.0
Non Profit Organ.	12.2	13.1	20.5	+ 8.3	+ 68.0
Misc. Services	5.2	10.3	14.5	+ 9.3	+178.8
Fed. Civilian Non-Defense	29.9	28.6	26.9	- 3.0	- 10.0
Fed. Civilian Defense	14.1	23.7	23.0	+ 8.9	+ 63.1
State Government	25.0	30.4	34.2	+ 9.2	+ 36.8
Local Government	64.7	80.6	96.6	+ 31.9	+ 49.3

NOTE: Detail may not add to totals due to rounding.

tries, each with an increase of 17,000 or more employes, accounted for 65-percent of the gross increase.

Growth in employment between 1947 and 1963 was highest in certain service industries. The numbers of people working in business services, medical and other health services, private education and miscellaneous services more than doubled. Employment also increased substantially in the finance, insurance and real estate group and in Federal and state government.

Retail trade had the highest employment of all non-manufacturing industry groups. Between 1947 and 1963 it accounted for approximately one-fourth of all non-manufacturing employment. Of the twenty-seven non-manufacturing groups, four contained about fifty-percent of all non-manufacturing workers. These industries are ranked in the following order: retail trade, local government, wholesale trade and construction.

DISTRIBUTION WITHIN SMSAs

The Planning Area has been divided into five subregions: the Boston, Brockton, Lawrence - Haverhill, and Lowell Standard Metropolitan Statistical Area, and an area designated as non-SMSA. The geographic distribution of manufacturing and non-manufacturing employment among these five subregions in 1947 and 1963 is presented in Table 16.

During the post-war period only the Boston SMSA increased its share of either total or manufacturing employment. In non-manufacturing, the Brockton and Lowell SMSAs and the non-SMSA all increased their shares, while the Boston SMSA's share declined.

Over the 16-year period manufacturing employment declined in all sections of the Planning Area (see Table 17). Manufacturing accounted for a smaller proportion of total employment in the Boston SMSA than it did in the other subregions. For example in 1963, 55.5 percent of all employment in the Lawrence - Haverhill SMSA and 49-percent of all employment in the non-SMSA were concentrated in manufacturing, compared with 26.7 percent in the Boston SMSA.

Although most of the subregions depend heavily on manufacturing, all of them moved toward more diversified industrial compostions during the study period (see Table 18). The percent employed in services increased in all subregions, while the percent employed in wholesale and retail trade increased in all but the Boston SMSA.(11)

---

(11) The Boston SMSA's decline is explained by the absolute decline in wholesale and retail trade employment in the City of Boston, a result of Boston's dramatic loss of population over the period.

TABLE 16

Distribution of Employment among SMSAs by Manufacturing & Non-Manufacturing 1947 and 1963

SMSA	Total 1947	Total 1963	Mfg. 1947	Mfg. 1963	Non-Mfg. 1947	Non-Mfg. 1963
Planning Area (workers in thousands)	1,137.5	1,284.6	428.9	394.0	708.6	890.6
			(percent distribution)			
Boston	79.8	81.1	68.4	70.5	86.7	85.8
Brockton	3.3	3.2	4.4	3.8	2.6	2.9
Law-Hav.	6.9	5.9	11.7	10.6	4.1	3.8
Lowell	3.8	3.7	5.6	5.2	2.8	3.0
Non-SMSA	6.2	6.1	9.9	9.8	3.9	4.5

TABLE 17

Percent Change in Employment Manufacturing and Non-Manufacturing by SMSA 1947, 1955, 1963

SMSA	1947 - 1955 Total	1947 - 1955 Mfg.	1947 - 1955 Non-Mfg.	1955 - 1963 Total	1955 - 1963 Mfg.	1955 - 1963 Non-Mfg.	1947 - 1963 Total	1947 - 1963 Mfg.	1947 - 1963 Non-Mfg.
Plan. Area	5.0	- 2.8	9.7	7.6	- 5.5	14.5	12.9	- 8.1	25.7
Boston	7.5	4.1	9.2	6.7	- 9.0	13.9	14.8	- 5.2	-24.3
Brockton	9.4	- 4.2	23.4	1.5	-15.4	14.5	11.1	-18.9	41.3
Law-Hav.	-21.3	-35.1	2.8	20.9	27.5	13.6	-4.8	-17.3	16.7
Lowell	-1.8	-11.2	9.6	10.5	- 3.4	24.1	8.5	-14.2	36.0
Non-SMSA	3.6	- 7.2	20.1	8.7	- 2.4	22.2	12.6	- 9.3	46.7

TABLE 18

Percent Distribution of Employment Among Major Industry Categories by SMSA 1947 and 1963

Industry Category	Boston SMSA 1947	Boston SMSA 1963	Brockton SMSA 1947	Brockton SMSA 1963	Law-Hav. SMSA 1947	Law-Hav. SMSA 1963	Lowell SMSA 1947	Lowell SMSA 1963	Non-SMSA Places 1947	Non-SMSA Places 1963
Manufacturing	32.3	26.7	50.4	36.9	63.7	55.5	54.9	43.5	60.9	49.0
Mining & Construction	4.4	4.6	2.7	4.4	2.3	2.8	2.3	4.4	3.0	4.0
Trans., Comm. & Util.	9.3	6.5	7.5	7.5	2.8	2.4	5.7	3.6	2.6	2.5
Wholesale & Retail Trade	24.4	23.0	19.9	24.5	13.5	16.1	16.7	18.3	12.3	16.0
Finance, Insur., & Real Estate	5.5	7.2	2.2	3.1	1.5	2.8	1.8	2.7	1.3	1.8
Services	12.1	17.7	5.1	9.0	8.2	12.0	8.7	16.2	6.1	8.2
Government	12.0	14.2	12.1	14.8	8.1	8.5	9.8	11.4	13.7	18.5
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

NOTE: Detail may not add to totals due to rounding.

V

NATIONAL MARKET INDUSTRIES

Long-term shifts in the national demand for goods and services have an important affect on the structure of the Region's industries. Some 33-percent of Gross Regional Product (12) in 1963 was produced by industries which serve predominately national markets. Among these "export" industries are: electronics, machinery, instruments, communications, equipment, insurance carriers, higher education, medical services, and miscellaneous business services. (13) Export industries accounted for a slightly larger share of total output in 1963 than they did in 1947 or 1955. And they accounted for approximately 34-percent of total employment in 1963, compared with 33-percent in 1947.

---

(12) Gross Regional Product is the regional equivalent of Gross National Product, which is defined as the market value of final goods and services produced by the economy in any given year. In this report "GRP," "output," and "product" are used synonymously.

(13) See "Method" for a description of how national market industries were identified. In this study 84 industry groups are considered national market oriented.

TABLE 19

Gross Regional Product by National and Local Market 1947, 1955, 1963

(millions of 1960 dollars)

	1947(14)		1955		1963	
	$	%	$	%	$	%
Total GRP	6138.8	100.0	7876.4	100.0	9786.9	100.0
National Mkt.	1921.3	31.3	2532.4	32.2	3238.8	33.1
Local Mkt.	4217.5	68.7	5344.0	67.8	6548.2	66.9

National market industries, in addition to being responsible for one-third of the Region's output and employment, are important because the income they bring into the Region generates demand for local goods and services. The relationship between changes in these industries and total changes in the regional economy may be stated as a ratio known as the "regional multiplier".

For example, between 1947 and 1963, employment in the Planning Area increased by approximately 147,000. Export (national market oriented) industries accounted for 42.6 percent (67,000) of this increase.(15) The regional multiplier is the reciprocal of this proportion of the total increase (1 ÷ .426), and thus equals 2.3. This suggests that during the 1947 to 1963 period, for every increase of 100 employes in the export sector, total employment increased by 230 employes.

---

(14) Excludes federal defense.

(15) As described in "Method", p. 65, the industry groups were classified as local or national market oriented in total, rather than being pro-rated.

The same calculation for output (Gross Regional Product) suggests that for every $100 increase in the output of export industries, total output increased by $260.

KEY INDUSTRIES

The product of national market industries showed a gross increase in real terms of $718.8 million from 1955 to 1963.(16) Most of this was due to increases in a few key industry groups. Ten industry groups accounted for 82-percent of the increased production in national market industries (see Table 20).

Defense - Space Industries: Five of the industry groups listed in Table 20 were either largely or entirely dependent upon the level and composition of national space - defense expenditures. They were: electrical machinery, transportation equipment, scientific instruments, miscellaneous services, and Federal defense - space establish-

---

(16) The figure $718.8 million represents the gross increase and thus exceeds the net change ($706.4) by an amount equal to the recorded declines in GP in textiles; and stone, clay, and glass.

TABLE 20

Increase in Product of National Market Industries
by Industry Group
1955 - 1963

Industry Group(17)	Millions of Dollars	Percent of Total
TOTAL INCREASE	718.8	100.0
1. Scientific Instruments	94.4	13.1
2. Insurance Carriers	79.9	11.1
3. Electrical Machinery	77.0	10.7
4. Private Education	72.8	10.1
5. Miscellaneous Manufacturers	72.2	10.0
6. Transportation Equipment	56.8	7.9
7. Medical - Other Health Services	37.4	5.2
8. Miscellaneous Services	35.1	4.9
9. Printing - Publishing	32.7	4.6
10. Federal Defense	28.6	4.0
All Other National Market Industries(18)	131.9	18.4

ments. The product of the national market components of these five groups rose by $291.9 million between 1955 and 1963, or nearly 41-percent of the increase in national market Gross Product and approximately 15-percent of the increase in Gross Regional Product. Over this same period, national market industries in these five groups accounted for 45.1 percent of the net increase in employment in national market industries and 11.3 percent of the increase in total employment. (19)

---

(17) Only change in national market components of the industry group are shown.
(18) Includes ten industry groups.

Region's Share of National Output: With the exception of the food and the textile industries, all national market industry groups in the Planning Area increased their GP over the 1947 to 1963 period. Despite this growth in the real value of output, the Region's share of national output declined in 66-percent of these export industries. (20) Conversely, some 34-percent of the Region's national market industries grew more rapidly than the national average.

---

(19) While estimates of the proportion of the Region's total output which was purchased either directly or indirectly by the Federal Government were not available, studies on this subject have been conducted for Massachusetts and New England. See, for example: Richard L. Pfister, Military Expenditures in New England, Federal Reserve Bank of Boston, Research Report No. 14, 1961; "New England's Electronic Future," New England Business Review, May 1964; "New England and the Impact of Defense Orders," New England Business Review, March 1965. A preliminary report from the 1963 Census of Manufactures, (Bureau of the Census, U. S. Dept. of Commerce) 1963 Census of Manufactures, Summary Series, Shipments of Defense - Oriented Industries in 1963 by Industry, Region, and Federal Agency, Preliminary Report, MC 63, p. 5, Washington D. C., March 1965, presents a measure of the impact of Government procurement on selected manufacturing industries identified as largely "defense-oriented." Government procurements were found to be 60.4 percent of the total value of shipments of these selected manufacturing industries for Massachusetts compared with 75.4 percent for Connecticut, 68.5 percent for New England, 61.6 percent for the Northeast Region, and 67.9 percent for the United States.

(20) The 84 industry groups identified as national market oriented were grouped into 41 export categories. Of these 41 industry categories, 27 experienced a loss in share.

MANUFACTURING NATIONAL MARKET INDUSTRIES

Based on a classification system prepared for the New York Metropolitan Region Study, national market manufacturing industries in the Planning Area were grouped into four categories: "transport-sensitive," "labor-sensitive," "external-economies," and "inertia-unclassified."(21) Transport-sensitive industries are those for which the cost of moving products to the market or of moving materials to the plant is the critical factor in location. Labor-sensitive industries are those for which either the cost or the skills of the work-force, or both, are critical to the choice of a location.

External-economy industries are typically those in which the size of the plant is small, a single plant is usual, and the horsepower - worker ratio is low. These factors are combined in industries which:

1) engage in "unstandardized" production,
2) cater to ever-changing demand by tooling and turning out their products in a short time,
3) depend on swift and efficient communication with customers and suppliers, and
4) rely on a host of other services and specialists to supply their needs on short notice.

---

(21) See Robert M. Lichtenberg, One Tenth of a Nation, New York Metropolitan Region Study, Harvard University Press, Cambridge, Mass., 1960, Appendix B.

The inertia-unclassified category contains industries whose location is the result of historical accident or factors no longer present. Also included are those industries whose present locations, while determined by still-existing factors, offer no current advantage. This category also contains industries which have developed because of links with industries already existing in the Region and those for which information is inadequate.(22)

Output and Employment: Both regionally and nationally, the inertia-unclassified group of industries had the highest national market manufacturing output. In 1963, industries in this group accounted for 44.4 percent of the Planning Area's national market manufacturing GP, a percentage slightly lower than the national average (see Table 21).

While transport-sensitive industries had the second highest output nationally, labor-sensitive industries were second in the Planning Area. The percentage of output accounted for by labor-sensitive industries in 1963 was 26.8 percent regionally and 17.3 percent nationally.

---

(22) This classification system is somewhat inadequate in its application to the Planning Area. For example, women's apparel, which in New York was considered an "external-economy" industry, is located in the Planning Area because of some other factor such as labor cost. Nevertheless, the system serves a useful analytic purpose.

In 1947, unskilled labor accounted for almost 30-percent of the Region's output in labor-sensitive industries, compared with only 9-percent by 1963. Skilled labor, on the other hand, increased from 70-percent to 91-percent over the same period. The direction of change was similar to that nationally, although the change was greater regionally (see Table 21).

While differences continue to exist between the Region and the nation, the trend over the 16-year period is clearly toward similarity in the distribution of output among these categories.

TABLE 21

Gross Product
of National Market Manufacturing Industries
by Dominant Location Factor
1947, 1955, 1963

	(percent distribution)					
	1947		1955		1963	
Location Factor	P.A.	U.S.	P.A.	U.S.	P.A.	U.S.
Transport-Sensitive	22.1	36.3	18.9	30.2	19.1	25.8
Labor-Sensitive	27.4	12.6	27.6	12.3	26.8	17.3
Unskilled	(29.7)	(25.9)	(11.7)	(20.9)	(8.7)	(13.1)
Skilled	(70.3)	(74.1)	(88.3)	(79.1)	(91.3)	(86.9)
External Economies	9.5	13.6	8.8	9.3	9.7	10.2
Inertia-Unclassified(23)	41.0	37.5	44.7	48.2	44.4	46.6
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0

(23) Data on aircraft industries were not available for 1947.

The distribution of employment among national market manufacturing industries followed the same pattern as that for GP (see Table 22). Again, the declining importance of unskilled labor is clear. In 1947 unskilled labor accounted for 45.5 percent of employment in labor-sensitive industries. By 1963 this figure had dropped to 11.4 percent.(24)

TABLE 22

Employment in National
Market Manufacturing Industries
by Dominant Location Factor
1947, 1955, 1963

	(percent distribution		
Location Factor	1947	1955	1963
Transport-Sensitive	17.0	16.9	17.8
Labor-Sensitive	32.0	27.4	28.3
Unskilled	(45.5)	(18.3)	(11.4)
Skilled	(54.5)	(81.7)	(88.6)
External Economies	12.2	13.3	13.2
Inertia-Unclassified	38.8	42.4	40.7
TOTAL	100.0	100.0	100.0

Rates of Change in Output: Output in industries for which skilled labor was the primary consideration in choice of location showed the fastest rate of growth in both the Region and the U. S. during the 1947 to 1955 period. Between 1955 and 1963 these same industries continued to grow at the most rapid rate nationally, but were surpassed in the Planning Area by the external economies and transport-sensitive industries.

---

(24) Had the non-manufacturing export industries been included, the importance of skilled labor would have been emphasized even more, especially in the 1955-1963 period. Industry groups such as health, private education, and business services depend heavily upon skilled labor and, as discussed below, are important export industries.

While output in the Region's skilled-labor-sensitive industries grew at approximately three-fourths the national rate between 1947 and 1955, it grew at only one-fifth the national rate from 1955 to 1963 (see Table 23). In the same two time periods, GP in the unskilled labor category declined in the Planning Area while it grew very slowly in the rest of the nation.

TABLE 23

Percent Change in Gross Product
of National Market Manufacturing Groups
By Dominant Location Factor
Planning Area and Remainder of U. S.
1947-55 and 1955-63

	1947 - 55		1955 - 63	
Location Factor	P. A.	Rest of U. S.	P. A.	Rest of U. S.
Transport-Sensitive	3.0	35.3	22.8	10.0
Labor-Sensitive	21.0	59.5	18.1	81.0
Unskilled	-52.5	28.5	-13.4	10.4
Skilled	52.1	70.1	22.1	98.9
External-Economies	12.1	12.1	33.3	40.1
Inertia-Unclassified(25)	30.6	45.8	21.5	24.5

(25) Data on aircraft industries were not available for 1947.

The relatively high growth rate of the Region's transport-sensitive industries between 1955 and 1963 was due largely to growth in paper products. Since markets in New England, and perhaps the New York metropolitan area, are important to paper products industries, improvements in the highway system (e.g., Massachusetts Turnpike and the completion of Routes 128, 24, I-93 and 1) undoubtedly enabled these firms to serve their markets more effectively.

NON-MANUFACTURING NATIONAL MARKET INDUSTRIES

The share of national market GP contributed by non-manufacturing industries is growing rapidly. The non-manufacturing share rose from 15-percent in 1947 to 26-

TABLE 24

National Market Gross Product
by Manufacturing and Non-Manufacturing
1947, 1955, 1963

	Percent Distribution			Percent Change	
	1947	1955	1963	1947-1955	1955-1963
Manufacturing	85.0	77.0	74.3	-9.4	-3.5
Non-Manufacturing(26)	15.0	23.0	25.7	53.3	11.7
TOTAL(26)	100.0	100.0	100.0	--	--

(26) Excludes Federal Defense in 1947.

percent in 1963.[27] The output of all five national market non-manufacturing groups increased over the study period (see Table 20 above).

During both halves of the study period, employment grew in all national market non-manufacturing groups except Federal defense.

TABLE 25

Change in Employment
in Non-Manufacturing Export Industries
1947-1955 and 1955-1963

Industry	Change in Thousands 1947-1955	Change in Thousands 1955-1963	Percent Change 1947-1955	Percent Change 1955-1963
All Non-Mfg. Export Industries	26.5	36.2	42.6	32.2
Insurance Carriers	3.5	6.5	17.2	27.2
Medical & Health Services	11.3	15.2	55.4	47.9
College & Universities	6.6	11.0	40.7	48.2
Miscellaneous Services	5.1	4.2	98.1	40.7
Federal Defense	N.A.	-.7	N.A.	-2.9

By 1963, medical and health services accounted for approximately 32-percent of the Region's employment in non-manufacturing export industries. This combined with employment in colleges and universities, accounted for 54-percent of national market non-manufacturing employment.

---

(27) Data for Federal defense industries were not available for 1947. As a result, the non-manufacturing share of national market GP in that year is understated and the percent change from 1947 to 1955 is overstated. If this adjustment were made, the growth rate from 1947 to 1955 would be less dramatic.

LOCAL MARKET INDUSTRIES

Industries serving predominantly local markets accounted for approximately 66-percent of the Region's 1963 employment. This is almost identical to the share of Gross Regional Product accounted for by local market industries in that year.

Non-manufacturing industries accounted for approximately 87-percent of this local market employment, a modest rise over the share contributed by non-manufacturing in 1947 and 1955 (see Table 26).

TABLE 26

Local Market Employment
by Manufacturing and Non-Manufacturing
1947, 1955, 1963

	1947		1955		1963	
	Number	%	Number	%	Number	%
Total Local Market[(28)]	722.9	100.0	783.5	100.0	851.3	100.0
Manufacturing	120.5	16.7	118.4	15.1	109.3	12.8
Non-Manufacturing(28)	602.4	83.3	665.2	84.9	742.0	87.2

---

(28) Excludes Federal Non-Defense in 1947

VI

MANPOWER

OCCUPATIONAL SHIFTS

Changes in technology and in the industrial composition of the Region brought shifts in the occupational structure of the Planning Area between 1950 and 1960. White collar occupations (professional, managerial, clerical and sales) rose from 45.9 percent of the labor force in 1950 to 50.5 percent in 1960. This represents a 15.5 percent increase in the number of workers in white collar jobs, with most of the gain in professional and technical occupations.

At the same time, the number of blue collar workers (craftsmen, operatives, and laborers) declined by six-percent. Most of this decline is attributable to low skill occupations. The number of laborers, and their share of total employment, declined substantially; but laborers have never been a very large proportion of the Region's labor force.

While the proportion of the labor force occupied in service industries did not change, the number of workers in these industries increased by six-percent. In many instances service occupations represent opportunities for workers with low skills and little education to shift to new jobs after a short period of retraining.

TABLE 27

Labor Force
by Major Occupation
Planning Area
1950 and 1960

Occupation	Percent of Total 1950	Percent of Total 1960
WHITE COLLAR		
Professional, Technical, and Kindred	11.3	14.8
Managers, Officials & Proprietors incl. Farm	9.9	8.8
Clerical and Kindred	16.4	18.7
Sales	8.3	8.2
Subtotal	45.9	50.5
BLUE COLLAR		
Craftsmen, Foremen & Kindred	14.9	14.5
Operatives & Kindred	23.0	20.2
Subtotal	37.9	34.7
SERVICES		
Private Household Workers	1.8	1.5
Service Workers, excl. Household	9.0	9.3
Subtotal	10.8	10.8
LABORERS		
Farm Laborers	0.5	0.3
Laborers, excl. Farm & Mine	4.9	3.7
Subtotal	5.4	4.0
TOTAL	100.0	100.0

SOURCE: Derived from U. S. Census of Population, 1950 and 1960.

TABLE 28

Occupational Structure of Selected Industries in the Boston SMSA 1950 and 1960

Occupation	Construction		Electrical Machinery		Transportation Equipment		Medical		Finance Ins. & R. E.	
	1950	1960	1950	1960	1950	1960	1950	1960	1950	1960
	(percent distribution)									
Professional, Technical & Kindred	6.5	6.2	13.5	21.0	6.2	13.8	55.5	48.4	5.1	5.5
Managers & Proprietors	9.4	9.4	3.0	5.0	2.4	3.1	2.0	2.2	14.2	14.7
Clerical & Kindred	4.1	5.6	17.4	16.1	10.9	13.9	12.7	14.8	50.6	52.9
Sales	.4	.3	1.3	1.0	.9	.6	.1	.1	16.6	16.0
Craftsmen, Foremen & Kindred	54.1	54.3	22.5	16.1	47.9	42.2	3.0	3.1	2.6	2.3
Operatives & Kindred	6.7	7.1	38.1	36.3	24.2	19.8	3.1	2.6	.8	.6
Service Workers excl. Household	.4	.4	1.7	1.4	1.9	1.8	22.7	27.2	8.5	5.2
Laborers, incl. Farm	18.3	16.0	2.3	1.0	5.2	3.0	.8	.3	1.4	1.2
Occupation not Reported	.1	.7	.3	2.1	.2	1.8	.3	1.3	.2	1.6
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

NOTE: Detail may not add to totals due to rounding.
SOURCE: U. S. Census of Population, 1950 and 1960.

These shifts in the Region's occupational structure reflect changes in the Region's industrial structure since World War II. The increasing importance of white collar occupations reflects the growth since 1949 in electronic and other science-related manufacturing, in finance, insurance and real estate, in business and medical services, and in government, all of which require substantial proportions of white collar workers. It also reflects the growing proportion of white collar workers required by such industries as electrical machinery and transportation equipment. Technological advances which increase the need in these industries for white collar workers also diminish the demand for blue collar workers (see Table 28).

MANPOWER UTILIZATION

The degree to which a region's manpower is being utilized can be estimated from the participation rate of the labor force, the unemployment rate and the "involuntary underemployment" rate.(29)

Participation Levels: The participation rate, or ratio of civilian labor force to civilian population, for males between the ages of 25 and 64 rose from 899 men per thousand in 1950 to 921 men per thousand in 1960, a modest growth of 2.4 percent. The highest level of male participation was in the middle age group (ages 45 to 54). However, the youngest group (ages 25 to 44), showed the greatest increase. The participation of older men (ages 55 to 64) lagged significantly behind that of the other two groups.

---

(29) Estimates of these three measures for the Planning Area were made from data in the U. S. Census of Population, 1950 and 1960. Only males between the ages of 25 and 64 were considered in the analysis, since adult men compose the major portion of the work force and changes in their utilization have a far greater effect on the Region's economy than changes in the work force status of women and teenagers.

TABLE 29

Male Labor Force Participation Rates
by Age Group
Planning Area
1950 and 1960

Age Group	(Civilian Rate) Per Thousand 1950	1960	Percent Increase
25-64	899	921	2.4
25-44	907	934	3.0
45-54	919	939	2.2
55-64	849	862	1.5

These growth rates are somewhat higher than estimates for the nation. A Resources for the Future study estimated that the nation's 25 to 44 year-old males increased their participation at about the same rate as those in the Region.(30)

---

(30) H. Landsberg, L. Fischman, and J. Fisher, Resources in America's Future, Patterns of Requirements and Availabilities 1960-2000, Resources for the Future, Inc., the Johns Hopkins Press, Baltimore, 1963. Middle level estimates for the nation were used.

But the increase in participation among 45 to 54 year-olds in the Region was almost one-percent higher than that for the nation; and, participation among older men (55 to 64 years) increased 1.5 percent regionally, while declining nationally.

Unemployment: Using the Boston SMSA as an indicator for the Region, the unemployment rate for the total labor force in 1960 was slightly over four-percent, according to Bureau of Labor Statistics data.(31) This compares favorably with the national unemployment rate. In addition, unemployment has gradually decreased since 1950, according to Bureau of Census estimates.

TABLE 30

Percent of Males Unemployed
by Age Group
1950 and 1960

Age Group	1950	1960	Change
25-64	5.4	3.4	-2.0
25-44	5.6	3.1	-2.5
45-54	4.8	3.3	-1.5
55-64	5.6	4.1	-1.5

The age group with the lowest unemployment rate in 1960 was that 25 to 44 years old. The highest rate was that for

---

(31) Bureau of Labor Statistics figures are for the total labor force including both sexes and all ages while the Bureau of Census data is only for 25 to 64 year-old males.

55 to 64 year-olds. However, unemployment among these older workers has decreased since 1950, perhaps as a result of early retirement among workers 65 and over. In addition, the participation rate of 55 to 64 year-olds has increased.

Involuntary Underemployment: The third measure of manpower utilization is "involuntary underemployment." This is the ratio of males working more than 14 but less than 39 weeks to total males working during the year.(32)

In 1960, 7.5 percent of the Region's males between the ages of 25 and 64 worked more than 14 but less than 39 weeks. The lowest rate of underemployment (6.8 percent) was among 45 to 54 year-olds. The 25 to 44 year-olds had a slightly higher rate of 7.2 percent; and the oldest group (55 to 64 years) had the highest underemployment rate (9.0 percent).(33) While the plight of workers 55 to 64 years old improved somewhat, 13-percent of them were still unemployed or underemployed by 1960.

---

(32) The term "involuntary underemployment" may be somewhat misleading because it implies that all men who work more than 14 but less than 39 weeks have been forced to do so by externally imposed circumstances. No doubt a portion of this under-utilization is voluntary on the part of the worker. Nevertheless, it is reasonable to assume that adult males, because of responsibilities as "bread winners", would normally work full-time and that anything substantially below that is involuntary.

(33) Low rates of underemployment coincide with high rates of participation.

EDUCATIONAL ATTAINMENT

The level of educational attainment in the Planning Area has risen since 1950. The proportion of 25 to 64 year-old males in the Boston SMSA who had completed four or more years of college rose from 12.6 percent in 1950 to 17.0 percent in 1960 (see Table 21). A larger percentage of the youngest group of men (25 to 44 years) were college-educated. The greatest percentage increase in college-educated men was also in this group.

Looking at the distribution of educational attainment in the Region by SMSA (Table 32), it may be seen that the Boston SMSA contained the largest percentage of college-educated males.(34) The other three SMSAs, although substantially below the Boston level, are steadily increasing their proportions of high school and college graduates. The lower educational level in the SMSAs outside of Boston, like their higher unemployment rates, may be related to the economic base of these three SMSAs. The Lawrence-Haverhill and Lowell SMSAs, in particular, are composed of manufacturing industries employing large proportions of blue collar

---

(34) The percent distribution for the Boston SMSA differs between Table 31 and Table 32 because Table 32 includes males 65 and over while Table 31 does not. Inclusion of males 65 and over reduces the proportion of educational attainment at the higher levels of achievement while increasing the proportions at lower levels.

TABLE 31

Educational Attainment
Among Males 25-64 Years
in the Boston SMSA
1950-1960

Last Year of School Completed	Ages 25-44 1950	Ages 25-44 1960	Ages 45-54 1950	Ages 45-54 1960	Ages 55-64 1950	Ages 55-64 1960	Ages 25-64 1950	Ages 25-64 1960
Males (thousand)	331.4	325.4	140.3	145.5	113.9	119.2	585.6	590.1
			(percent distribution)					
NO SCHOOL	.4	.4	1.3	.8	5.3	2.4	1.6	.9
ELEMENTARY								
1-4	1.5	.9	4.7	1.6	8.9	4.3	3.7	1.8
5-6	2.6	2.0	6.7	4.0	9.3	7.1	4.9	3.5
7	2.9	2.4	5.5	4.6	5.3	6.0	4.0	3.7
8	9.8	7.4	17.8	14.6	20.2	21.4	13.7	12.0
Subtotal	17.2	13.1	36.0	25.6	49.0	41.2	27.9	21.9
HIGH SCHOOL								
1-3	21.4	20.3	21.6	22.8	19.2	21.3	21.0	21.1
4	36.1	33.7	23.4	27.6	18.8	18.5	29.7	29.1
Subtotal	57.5	54.0	44.0	50.4	38.0	39.8	50.7	50.2
COLLEGE								
1-3	10.9	12.1	7.4	10.4	5.0	8.3	8.9	10.9
4+	14.5	20.8	11.6	13.7	8.0	10.7	12.6	17.0
Subtotal	25.4	32.9	19.0	24.1	13.0	19.0	21.5	27.9

SOURCE: Calculated from the U. S. Census of Population, 1950 and 1960.

workers, occupations which require low to medium levels of formal education. It is not surprising, therefore, that the population with low to medium levels of schooling should be attracted to these areas, which offer the best opportunities for them.

Despite the increase in higher education, the U. S. Census reported in 1960 that 50-percent of all males 25 years and over in the four SMSAs had completed no more than three years of high school. Almost thirty-percent of this group had completed no more than the eighth grade. Even among men 25 to 44 years old, some 13-percent have an eighth-grade education or less, and another 20-percent failed to complete high school.

TABLE 32

Educational Attainment
Among Males 25 Years and Over
by SMSA
1950 and 1960

Last Year of School Completed	4 SMSA's		Boston		Brockton		Law.-Hav.		Lowell	
	1950	1960	1950	1960	1950	1960	1950	1960	1950	1960
Males 25 Years + (thousands)	798.0	839.7	682.9	704.1	39.5	41.3	37.7	52.6	37.9	41.8
				(percent distribution)						
NO SCHOOL	2.4	2.4	2.3	2.4	3.3	2.5	3.7	3.5	1.9	1.8
ELEMENTARY										
1-4	4.8	3.0	4.6	2.9	4.7	3.2	8.2	4.0	5.7	2.8
5-6	6.3	5.0	5.9	4.6	7.3	5.3	9.1	7.4	9.2	8.1
7	4.6	4.6	4.3	4.1	4.9	5.1	7.6	7.5	7.5	8.6
8	15.7	14.5	15.0	14.0	17.0	15.8	23.1	18.8	19.9	17.8
Subtotal	33.8	29.1	32.1	28.0	37.2	31.9	5.17	41.2	44.2	39.1
HIGH SCHOOL										
1-3	20.4	20.6	20.3	20.2	24.6	24.8	16.4	20.7	21.3	22.6
4	27.1	26.1	27.8	26.5	25.5	26.8	20.8	22.4	22.6	23.8
Subtotal	47.5	46.7	48.1	46.7	50.1	51.6	37.2	43.1	43.9	46.4
COLLEGE										
1-3	7.8	9.6	8.1	9.9	6.2	8.7	5.4	7.4	6.3	7.4
4+	10.9	14.1	11.7	15.3	6.5	7.8	5.7	8.2	5.7	7.0
Subtotal	18.7	23.7	19.8	25.2	12.7	16.5	11.1	15.6	12.0	14.4

SOURCE: Calculated from the U. S. Census of Population, 1950 and 1960.

METHOD

The kind of data to be collected for a study such as this is largely governed by the type of measures desired and by the methods chosen to produce these measures. Planning for regional transportation and development (1) required projections of:

employment by industry;

population, labor force and heads of household by age and sex; (2) and

personal income and consumer expenditures, especially for transportation.

---

(1) This project, officially known as the Eastern Massachusetts Regional Planning Project, is being carried out by the Council in collaboration with the Massachusetts Department of Public Works and the Massachusetts Department of Commerce and Development. It is financed by a 701 planning grant under Contract Mass. P-34 between the Department of Commerce and Development and the Housing and Home Finance Agency and through Highway Planning and Research funds made available by the U. S. Bureau of Public Roads.

(2) Population analysis is not discussed in this volume. The extensive demographic study was conducted independently of the economic base analysis and will be discussed separately in a third volume.

Projections were to be made by five year intervals from 1970 to the year 2000.

Development of an integrated system of regional economic accounts was not feasible within the time limit imposed. Data collected, however, will facilitate the preparation of such accounts at some future time.

In order to build a foundation from which to make reasonable projections of future economic activity, historical estimates for the Region were prepared for:

1. Gross Regional Product and Gross Product by industry,
2. Employment,
3. Wages and salaries,
4. Personal income by source, and
5. Consumer expenditures by major categories.

No attempt was made, however, to prepare estimates of local investments, imports of goods and services, or federal, state and local government expenditures for goods and services other than payrolls for their own employes. The flow of money into and out of the Planning Area, consisting of interest, dividends, investment capital and Federal tax payments less transfer payments, also was not dealt with in this study.

NATIONAL MARKET ORIENTED INDUSTRIES

As a first step in the development of the projection model, the Area's economy was disaggregated into national and local market activities. This was accomplished by means of location coefficients.

The location coefficients were determined by computing for each three-digit industry group (3) the ratio of per capita employment in the Planning Area to per capita employment in the United States. The theory of location coefficients suggests that where the ratio is less than one, the industry serves purely local markets. In those cases where the ratio was greater than one, the share of employment in export activity was estimated by dividing the location coefficient, minus unity, by itself.

Because of time constraints and the number of industries involved, it was decided that each three-digit industry would be classified as either entirely export or entirely local. An industry having more than 36-percent of its employment in export activity was classified as "export." On this basis, some 84 three-digit industry groups were classified as predominantly national market oriented.

The net effect of this approach is, of course, unknown. For example: export activity is understated when industries which sell goods and services primarily for local markets are considered entirely local market-oriented; yet, export activity is overstated when industries producing primarily for export are considered wholly export.

---

(3) Refers to Standard Industrial Classification (SIC) system used by the U. S. Bureau of Labor Statistics, Department of Labor.

LOCAL MARKET ORIENTED INDUSTRIES

A "local market oriented industry" was defined as one having less than 36-percent of its employment in export activities. Many of these industries sell some of their output of goods and services in either a national or a sectional market, but their main stimulus for growth comes from demand within the Planning Area.

While the use of location coefficients to estimate indirectly the geographic demand for a region's output is not without its faults, the method is technically superior to what is known as the "assumption approach." (4) In this method, an arbitrary assumption is made as to what is to be considered export employment or local employment in the region under study. The most common assumption is that employment and output in all manufacturing industries and in agriculture is export-oriented, while the remaining non-manufacturing industries serve local markets.

The degree of error in such an approach can be enormous, especially in a large region where several manufacturing industries (e. g., higher education and home offices of insurance companies) are export-oriented. While more refined assumptions could be made, they still remain essentially arbitrary and without emperical evidence.

---

(4) A third indirect method, the "minimum requirements technique," which is a variation on the location coefficient method, was not considered applicable to this study. For a discussion of this method see: Edward L. Ullman and Michael F. Dacey, "The Minimum Requirements Approach to the Urban Economic Base," Papers and Proceedings, Regional Science Association, VI (1960), pp. 175 - 194.

DATA COLLECTION

Employment: Estimates of employment by industry (5) were developed for ten selected years beginning with 1947 and ending with 1963, the latest year for which data were available at the time the study was begun. The Massachusetts Division of Employment Security provided data on employment covered by that program, which was some 70-percent of total employment. These data were made available for each of the 152 cities and towns in the Planning Area. This city and town data was then aggregated to obtain employment estimates for the total Planning Area and for the SMSA subregions (Boston, Brockton, Lawrence-Haverhill and Lowell SMSAs and a non-SMSA). Because of major changes in SIC definitions in 1958, it was necessary to adjust data for the years 1947 through 1957 in order to develop comparable information. This adjustment was accomplished through use of 1958 data for the State presented on an "old" and "new" code basis as well as U. S. Bureau of Labor Statistics (BLS) memoranda describing in detail the changes in industry definitions. (6)

---

(5) Three-digit SIC categories were used.
(6) BLS Technical Staff Memoranda, Dec. 17, 1957 and March 28, 1958.

The remaining 30-percent of all employment (7) was estimated from a wide variety of sources. (8) Considerable assistance was received from the regional office of the BLS, as well as other public and private agencies.

Wages and Salaries: Data on wages and salaries in each three-digit industry were collected in a manner similar to that described for employment. The Division of Employment Security provided this information on punch cards for each of the 152 cities and towns for those industries falling under its jurisdiction. Wages and salaries in the remaining industries were estimated simultaneously with the employment estimates for those industries. (9)

GROSS REGIONAL PRODUCT

Gross Regional Product (GRP) was estimated as a measure of industrial output in the Region. GRP is comparable to Gross National Product, the familiar GNP, which is the market value of all final goods and services produced nationally in any given year.

---

(7) "Uncovered" industries include railroads private elementary and secondary schools, private colleges, private hospitals, religious and charitable organizations, non-profit educational and scientific research agencies, federal government, State government, local government, self-employed, domestics and unpaid family workers.

(8) With few exceptions this was estimated by city and town.

(9) For more detailed information on estimation procedures and resources, interested persons should contact the Metropolitan Area Planning Council staff.

The value of the national product can be conceived either as the sum of all payments to the factors of production (labor, capital) or as the sum of all expenditures by consumers, investors and governments, since every expenditure on goods and services by one person becomes a receipt of income to someone else. These receipts are in the form of wages and salaries, profits, depreciation and indirect taxes. As a result, we can say that Gross National Product, as measured by expenditures, is identical to Gross National Income, as measured by payments to factors of production. (10)

The value of an industry's sales minus the cost of goods and services purchased from other industries constitutes the value which the given industry adds to total national output. And the Gross Product (GP) of a particular industry, or the value it adds to GNP, is exactly equal to the gross incomes originating in that industry. (11)

---

(10) While conceptually identical, there will be a statistical discrepancy in attempting to estimate separately the income and expenditure accounts.

(11) GP is akin to "value added", a measure used by the U. S. Bureau of the Census in its periodic Census of Manufactures. However, as defined by the Census, the two concepts are not identical in that GP excludes all intermediate purchases while "value added" is a more gross measure of output. GP was used in this study because it avoids double counting.

These four ways of looking at Gross National Product also apply to Gross Regional Product. They are shown below:

ALTERNATIVE CONCEPTS OF GROSS NATIONAL PRODUCT

Expenditures by:	Gross product originating (sales minus purchases) in:	Gross incomes in the form of:	Gross incomes originating in:
. Consumers . Investors . Government . Foreigners (net) . Plus: Additions to Inventories	. Agriculture . Mining . Manufacturing . Trade, etc.	. Wages and salaries . Wage supplements . Net interest . Rents and royalties . Corporate profits . Capital Consumption allowances . Sales and other indirect business taxes . Less: Net subsidies	. Agriculture . Mining . Manufacturing . Trade, etc.
Gross National Product (and GRP) =	Gross National Product (and GRP) =	Income (and GRP) =	Gross National Income (and GRP)

The Planning Area's Gross Product was estimated for each two-digit and 57 selected three-digit manufacturing groups and for 27 categories covering all non-manufacturing industries except agriculture and fisheries.

The estimation procedure was based on an assumed relationship between wages and salaries in each industry and the Gross Product of that industry in the Planning Area. In order to establish these relationships for the

Region, national data was obtained as a starting point.(12)

Use of national data to develop GP estimates for industries within the Planning Area assumes that the composition of two-and three-digit SIC categories was the same in the Planning Area as it was in the U. S., or that differences were off-setting. For a well-developed and diversified economy such as that in the Planning Area, this assumption seems realistic, especially in the case of three-digit categories. Furthermore, there is evidence of constancy of factor shares across regional boundaries.(13) This evidence lends support to the application of national data on the returns to factors of production to industries in the Region.

---

(12) The following studies provided the foundation from which the regional estimates were ultimately derived: Charles L. Schultze, _Prices, Costs and Output_, Committee for Economic Development, 1960, New York, New York; and, Charles L. Schultze and Joseph L. Tyron, "Prices and Costs in Manufacturing Industries," _Study of Employment, Growth and Price Levels_, Study Paper No. 17, Joint Economic Committee, Wash., D. C. Since Schultze's data only covered the period 1947-58, they were extended on the basis of the movement in National Income Originating between 1958 and 1963 as reported in the _Survey of Current Business_.

(13) See, for example, Lowell Gallaway, "Regional Capital Estimates by Industry, 1954-1957," _Southern Economic Journal_, Vol. 20 (July, 1962) 21 - 25. For a recent effort in estimating GRP for the State of Maryland, see John W. Kendrick and C. Milton Jaycox, "The Concept and Estimation of Gross State Product," _Southern Economic Journal_, Volume 32, October, 1965.

Since national data on GP was available only at the two-digit level, it was first necessary to obtain national estimates for three-digit industry groups.(14) These three-digit estimates for the United States were derived by assuming that the proportion of two-digit GP contributed by a three-digit subcomponent would be the same as the proportion of two-digit value-added contributed by that three-digit subcomponent.

Thus, symbolically for each yearly estimate,

$$ {}^{3}(GP)_{U.S.} = {}^{2}(GP)_{U.S.} \cdot \frac{{}^{3}VA_{U.S.}}{{}^{2}VA_{U.S.}} $$

where the superscripts indicate the level of industry classification, and subscripts indicate geographic coverage.

In order to derive three-digit estimates for the national market industries in the Planning Area, it was assumed that factor shares would remain constant across regional boundaries. It was further assumed that the ratio of Gross Product to wages and salaries in the three-digit and two-digit industries would be similar to comparable ratios of value-added to wages and salaries.

Thus,

$$\frac{{}^{3}\frac{GP}{W\&S}}{{}^{2}\frac{GP}{W\&S}} = \frac{{}^{3}\frac{VA}{W\&S}}{{}^{2}\frac{VA}{W\&S}}$$

or,

$$\frac{{}^{3}\frac{VA}{W\&S}}{{}^{2}\frac{VA}{W\&S}} \cdot {}^{2}\frac{GP}{W\&S} = {}^{3}\frac{GP}{W\&S}$$

Since wages and salaries are known at the three-digit level, this relationship may be used to estimate Gross Product at the three-digit level. Thus,

$${}^{3}\frac{GP}{W\&S} \cdot {}^{3}W\&S = {}^{3}GP$$

Given the assumption that the ratio of value added to wages and salaries will remain constant across regional boundaries, it may be said that:

$$\frac{{}^{3}\frac{VA}{W\&S}_{\text{Mass.}}}{{}^{2}\frac{VA}{W\&S}_{\text{Mass.}}} \cdot {}^{2}\frac{GP}{W\&S}_{\text{U.S.}} \cdot w\&s_{\text{p.a.}} = {}^{3}GRP$$

The superscripts indicate the level of industry detail, and the subscripts indicate Massachusetts (Mass.), United States (U.S.) and the Planning Area (P.A.).

The Planning Area's Gross Product in each of the 57 three-digit national market industries was derived in this manner for each of the ten selected years.

With three exceptions, each two-digit manufacturing industry in the Planning Area had both national market and local market subcomponents.(15) The local market subcomponents of each two-digit manufacturing group were added together and the same estimation procedure as described above was used to derive GP estimates for these industries.

The sum of the GP estimates for the Region in the three-digit national market and the local market industries provided one estimate of the Planning Area's GP in each two-digit manufacturing group.

Alternatively, and as a check on consistency, the two-digit totals were also derived separately in the following manner:

$$^{2}GP_{P.A.} = \frac{^{2}GP}{W\&S}_{U.S.} \cdot {}^{2}W\&S_{P.A.}$$

Any difference between these two estimates was adjusted at the three-digit level by multiplying the three-digit GP estimates by the ratio of the two-digit estimates. Symbolically:

$$\frac{^{2}GP_{P.A.}}{^{3}GP_{P.A.}} \cdot {}^{3}GP_{P.A.} = \text{Adjusted } {}^{3}GP_{P.A.}$$

---

(15) The three exceptions were tobacco, lumber, and petroleum products which were classified as entirely local market-oriented.

These adjusted estimates of GP at the three-digit level formed the basis for all future calculations. Estimates of the Planning Area's GP and wages and salaries by industry were then converted to constant dollars.(16)

Non-Manufacturing Industries: Estimates of Gross Product were also derived for 27 non-manufacturing categories in the Planning Area for ten selected years between 1947 and 1963. Of these 27 groupings, five were classified as national market-oriented while the remainder were classified as predominantly local market-oreinted.

The method of deriving Planning Area estimates for the non-manufacturing industries followed exactly that outlined above for the manufacturing industries. Thus, the typical procedure in each industry group involved three major steps:(17)

1. Compute the national ratio of GP to wages and salaries for the industry group;
2. Estimate Planning Area GP for the comparable industry group, based on available wage and salary data;

---

(16) This conversion, for each industry, was based on an index of National Planning Association estimates of GP in constant dollars to Schultze estimates of GP in current dollars. Schultze and Tyron, op. cit.

(17) Variations in availability and form of data for some years and industry groups necessitated departures from the "typical" method described above. These modifications are not described here since this would require an industry-by-industry tabulation.

3. Convert all dollar values to 1960 constant dollars on the basis of the NPA price index for that industry group.

PRODUCTIVITY PER WORKER

Since estimates of output per man-hour by industry were beyond the scope of this project, estimates of Gross Product per worker were calculated for each industry. This was done to provide a basis for deriving employment from projected Gross Product. In addition, this measure allowed for a rough comparison of the Planning Area's performance with national performance.

PERSONAL INCOME

Personal income as used in this study is identical to that reported by the U. S. Department of Commerce for the nation and individual states. Current dollar estimates of total personal income were prepared for the years 1947, 1950, 1955, 1960 and 1963. The technique used was largely patterned after that used by the State of Pennsylvania.(18) Essentially, this meant finding an appropriate factor by which to measure the Planning Area's share of a particular source of income in the State. State income estimates were those prepared by the U. S. Department of Commerce,(19) supplemented by data on a few other sources of income such as welfare payments and unemployment compensation. Sources estimated were: wages and salaries by industry, other labor income, farm and non-farm proprietor's income, property income, dividends, interest (private monetary and imputed, and government) and monetary and imputed rental income, seven categories of transfer payments, and personal contributions for social insurance.

---

(18) Bureau of Statistics, Department of Internal Affairs, Pennsylvania's Personal Income by Type and County, Report No. 1-1, Harrisburg, Pennsylvania, 1963.

Constant 1960 dollar estimates of total personal income were based on the wages and salaries obtained from constant dollar estimates of GRP. The current dollar ratio of wages and salaries to current dollar total personal income was used to convert the constant dollar wages and salaries to constant dollar total personal income.

PRIVATE CONSUMER EXPENDITURES

The distribution of expenditures among 13 categories was estimated for the same five years as personal income. These estimates were based on surveys of the distribution of average family expenditures made by the U. S. Bureau of Labor Statistics for the Boston SMSA and the U. S. for the years 1950 and 1960-61, and on U. S. Department of Commerce surveys of the percent distribution of consumer expenditures for the U. S. for each of the five years studied. BLS categories were made comparable with those employed by the U. S. Department of Commerce in its national income accounts to the extent feasible.

---

(19) U. S. Department of Commerce, Personal Income by States Since 1929, A Supplement to the Survey of Current Business, Washington, D. C., 1956 and Survey of Current Business, August 1959, 1963 and 1964.

The method involved two steps:

First, the ratio of the percent of family expenditures spent on a particular category in the Boston SMSA to the percent of family expenditures spent on that category in the nation was computed from BLS data for both 1950 and 1960-61. These ratios were interpolated to obtain a similar ratio for 1955.

These ratios were then applied to the percent distribution of total consumer expenditures estimated for the nation by the U. S. Department of Commerce for the years 1947, 1950, 1955, and 1960, and 1963. Because of the peculiar results obtained by this method for auto purchase and operation, expenses in this category were estimated from data on sales by merchandise line as published in Census of Business, 1963.

---

(20) Ratios for 1950 were applied for 1947 and 1960 ratios were applied for 1963.